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ABSTRACT

This paper describes the development of children's ability to pose and answer questions and discusses the teacher's role in enhancing these problem-solving skills. Several chapters review theoretical and empirical work related to these issues: models of man, general intellectual development, the mother's role in children's intellectual development and questioning and answering abilities, and the effect of social class on intellectual development. Research and theory related specifically to the development of questioning skills are discussed. Later chapters describe a variety of investigations of questioning and answering abilities of 8- through 10-year-old children carried out in several schools in Australia. Procedures, materials and results are reported in detail. Suggestions are made for classroom applications of information based on the results of these and other studies. A specific example of enhancing questioning skills is presented. Final chapters discuss the importance of inservice teacher training to provide teachers with the interest, information and skills necessary both to carry out teacher-based action research in their classrooms and to utilize the results of such studies in their everyday teaching techniques. (BD)

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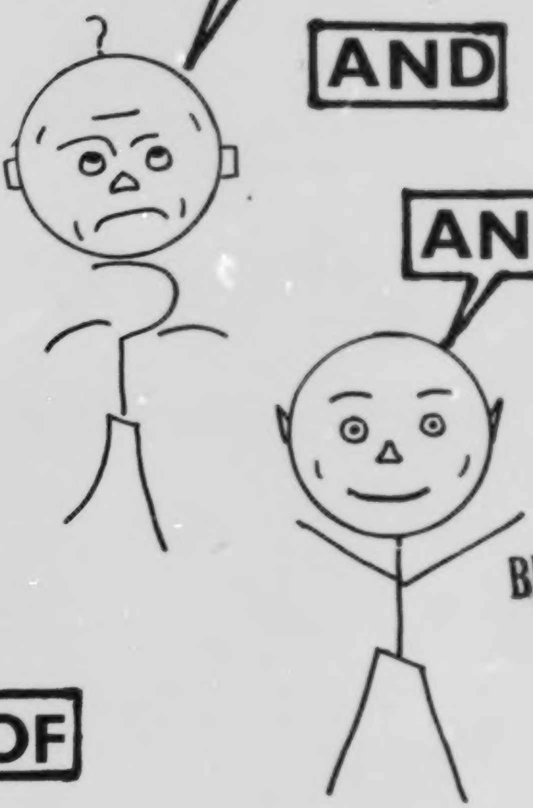
QUESTIONING AND ANSWERING OF SCHOOL CHILDREN



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by

W. P. Robinson & S. J. Rackstraw

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QUESTIONING AND ANSWERING SKILLS IN CHILDREN

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QUESTIONING AND ANSWERING SKILLS
IN CHILDREN

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Our most important debt is to the Joseph Rowntree Memorial Trust whose funds supported the research. As our grant for the investigation of determinants of questioning and answering in Primary School children ran into its last official year of operation, we had the opportunity of embarking upon a school-based set of investigations. These seemed to us to constitute an eminently suitable enterprise, and we were grateful that the Rowntree Memorial Trust felt they could give us a year's extension to take advantage of this possibility.

We in fact collected considerably more data than we were able to process within the life-span of the grant, but judged it better to collect more and write later. This report contains reports of the investigations conducted. The Introduction and Appendix describe the context of the research operation. Suffice it to note here that the venture would not have commenced without the initial introductions of Peter Armistead (then English Adviser to Southampton LEA) and the subsequent good offices of Norman Griffiths (then Primary Adviser to Southampton LEA) who brought together the group of Middle school teachers. And nothing would have been possible had not Southampton LEA endorsed the validity of our activities by granting us permission to do the work and by allowing us to use its Curriculum Centre as a base. Our thanks to Mac Davidson and his staff for their hospitality.

It is half-inappropriate to thank the participating teachers for their help since they are incorporated as collaborators. However it is appropriate to record that they came to the meetings regularly and enthusiastically in spite of having done their full days' work at school and in spite of the inclement wintry conditions that coincided with the project's life.

Research workers do become discouraged that the educational world ignores, derides or misinterprets their efforts to bring greater understanding and knowledge into the classrooms. It is the existence of teachers like those who took part in this venture who encourage us to persevere.

INTRODUCTION.

'... And truth beauty. That is all ye know on earth and all ye need to know.' If we can remain detached from the excitement of this romantic aspiration, we may note an implicit claim to aesthetic knowledge. To Keats it would have seemed absurd to suggest that man did not know what was beautiful and what was not. Sir Thomas More was obliged to deny the validity of King Henry's Act of Supremacy; to have offended against what his conscience told him was a moral truth was too great a price to pay for his head. At less cost, Galileo is credited with the final word in his disagreements with the Inquisition about the mobility of the earth, 'And yet it moves'. Martin Luther had no option but to accept his experience of God and assert, 'Here I stand. I can do no other.'

Each is a claim to knowledge. Each is a claim to have apprehended a truth. The types of knowledge apparently differ; their customary differentiating labels would be aesthetic, moral, scientific, and religious. At various times through various means, philosophy has denied the validity of each of these kinds of knowledge and has allowed only logic to have truths which are sacrosanct and incontrovertible and those invariably by definition and occasionally with reluctance. It is of course true that when these other types of knowledge are evaluated against the criteria appropriate to checking truths of logic, they fail to meet these, again by definition. It might have been more sensible to evaluate any claim made through the application of measures appropriate to that kind of knowledge. Chemistry performs tests unlike those used by literary critics to check its claims. Moral judgements can be defended as true without recourse to prayer. There are no publicly demonstrable experiments to check whether Jesus was the Son of God. When the Quaker George Fox described his religious conviction with the claim 'And this I knew experimentally', he was hoping that others might also search and achieve authentic experience of God, but he was not suggesting that controlled laboratory demonstrations would be relevant to conversion. One of the great tragedies of man has been his failure to distinguish between types of knowledge. He has failed to see that the most appropriate and feasible means of acquisition necessarily vary with the kind of knowledge and that the sensibleness of tests of its adequacy must also differ.

A related tragedy has lain in the lengths to which cultures have gone to prevent their members from acquiring knowledge. In a different context Thomas Paine expostulated, 'Every age and generation must be as free to act for itself, in all cases, as the ages and generations which preceded it. The vanity and presumption of governing beyond the grave is the most ridiculous and insolent of all tyrannies' (1791; Penguin, 1969, p.63). He failed to see that we can in fact never do better than educate children within the limitations of our own knowledge and beliefs, but he is right that, in the long run, there is little to be gained by forcing children to say that they believe things they do not. The imperative 'Believe!' cannot be obeyed, whatever kind of knowledge is in question.

One paradox from which we suffer is that we wish to educate our children as efficiently and honestly as possible, but at the same time we seem to be frightened that, if we do not exact a strong measure of conformity, the children will suffer. This presumes that our own beliefs and conduct are only validated, supported, and held in check by the possible sanctions others would inflict upon us if we were to doubt or to deviate. Do we really believe this? Fortunately each generation of children at least begins its life uncontaminated and asks why the kings it encounters are not wearing clothes.

(ii)

Another paradox, sometimes used to justify indecisiveness, is that we believe we have to guess what knowledge will be useful when the children grow up, although clearly such star-gazing can not be validated before the fact.

Whether the first paradox might be resolved by finding that demands for insincere conformity are unnecessary and eventually counter-productive is an empirical question yet to be tested. If Piaget's (1930) views about the development of moral reasoning and behaviour of children are correct, it might be beneficial and instructive to start to take the risk.

The second seems to be based on a false premise. It may be true that computer technology and aerodynamics date fast. It is not true that all science changes that quickly. It is not true that the underlying logics date. It is not true that what is right and beautiful necessarily changes. Religious claims extant are eternally true or false.

The belief that we do not know what to teach children in school is based on a narrow conception of the role of education. The occupational structure of adult society changes; new jobs requiring new skills emerge, occupants of old jobs need to acquire new knowledge to function effectively, old skills become redundant. So much is true. If we identify education closely with the function of fitting trained people into particular jobs, then our ignorance of the extent and nature of changes will indeed preclude accurate prediction even if we accept that most jobs can be learned much more quickly than we are wont to pretend. But we should presumably prefer to argue for more functions to education than recruitment to the occupational structure, and if we do so, we may find it less difficult to decide what it is desirable to learn.

One recent proposal is to solve problems of the functions of education by focusing on processes of knowledge acquisition rather than upon content and to argue that education should equip people to become 'independent general problem-solvers.'

Children should learn how to acquire knowledge. Confronted by the problematic, the vague or the confusing, they should be able to extract, define, and classify the hidden problems; they should be able to think up ideal and feasible ways of collecting evidence that will help the decision making; they should be able to evaluate and decide upon sensible courses of action that they can justify. They should also of course be enabled to act effectively upon their decisions.

It is not uncommon for 'problem-solving' to be interpreted narrowly as intellectual exercises, but the range intended here is very much wider. All decisions that we take are attempted solutions to problems. Knowing how to kick a football into a goal or how to cook spaghetti are as much part of knowledge as knowing that Julius Caesar was a Roman Emperor or that the angles of a triangle sum to one hundred and eighty degrees. Knowing that 'I never done nothing' functions as the grammatically accepted realization of a statement in certain sub-cultrual groups is equivalent to knowing that 'I did not do it' is the accepted realization in others.

We must distinguish between knowledge and the value placed upon it. What is to count as valuable knowledge is socially contingent. People define what is worth knowing. There needs to be such definition, but it should be seen to be subject to change from place to place, time to time, and situation to situation.

Our immediate concern is the relative emphasis to be placed upon 'knowing that' and 'knowing how to find out'. It is asserted that British primary schools have switched their emphasis from the former to the latter to such an extent that children no longer master useful skills and knowledge such as multiplication tables and spelling. Doubtless the change can be substantiated; it is to be regretted that attempts at innovation are as likely to be excessively espoused as they are to be ignored or otherwise misunderstood.

A recently completed research project (Robinson,1974) gave no grounds for assuming that children generally knew much about finding out or valued such skills. The general cheer of the Plowden report is perhaps grounded on the observations of a deviant minority by an over-optimistic set of well-wishers.

If the model of man presented in chapter 1 is viable, we human beings are designed to find out about finding out. We are naturally curious scientists. To facilitate this development the educational system has only to guide and train the growth of skills which it is a child's innate disposition to acquire. It has also to find out what can best be learned in what order.

This is not to say that this model of man represents the whole of his nature nor that 'knowing' is the only valuable relationship to the world that children need acquire. But these are what are of most concern here. We further recognize that although question posing in some form may be central to all deliberate learning, asking questions of other people is only one means of attempting to obtain answers (see chapter 3). Further, it is absurd to look at questioning independently of answering. We treat the two together.

The study of questioning and answering is played out at two levels; there is a play within a play, spelt out in more detail in the Appendix.

At one level we were psychologists and teachers cooperating to generate knowledge about the questioning and answering capacities and preferences of children. We hoped that the pooled knowledge of teachers and psychologists would provide a higher success rate in worthwhile experimentation than either group acting alone would have done.

But at another level we were hoping to encourage the teachers to adopt a more systematically experimental attitude to their teaching. We were trying to persuade them that both the methodology and content of psychology could be exploited to find out about the learning of real children in real classrooms. Training courses for teachers are not widely renowned for their provision of knowledge about child development in particular or heuristic skills in general. Teachers have not themselves been educated to be independent general problem-solvers. 'And if the blind shall lead the blind, shall not they both...?' Hence we hoped that the account of child development offered to teachers in lectures and reading, along with the experiments conducted, reported, and evaluated, would begin to equip them with skills for finding out about teaching.

With the advent of the James' Report, it seems to have become generally recognized that teaching, as any other profession, is based on changing knowledge, values, and fashions. Consequently teachers need to be provided with time for 'research and development' as well as for 'production'. When this time is institutionalized, what will fill it? There are and will be many candidates for inclusion, but we hope our instance has several general characteristics that will be commonly included.

Firstly, in trying to answer our questions about children's behaviour we have observed their behaviour. We have not simply asked experts what they thought was best for the children, except as an initial source of ideas. As we later remark, it is common to cite the experience of the designer of a scheme or the favourable judgements of educational worthies as evidence for or against the value of some scheme or project. Argument from 'authority' is irrelevant to the ultimate efficacy for the learning of the children; that is an empirical matter to be decided by experimentation and not by appeal to expert opinion.

Secondly, the structure and content of the course was a collaborative venture. Most of the initiative came from the side of the organizers, as is to be expected. We had objectives; we tried to specify these and to discuss the means of achieving them with the teachers. However we were, in fact, more diffident than perhaps we should have been, and in any future enterprise would seek to be more definite and explicit about our goals while at the same time consulting the teachers more - and being happily prepared to be moved by group consensus. To have had quite definite goals that were not made explicit and agreed upon was to be regretted. To have had no goals, but to have hoped that they would have emerged, would have been worse.

Thirdly, but very weakly, we attempted to evaluate the efficacy of the course itself. In what ways was it a success and in what ways a failure? Here our diffidence was inexcusable. We prepared pre- and post-tests of various kinds, but were frightened that they would frighten the teachers away. On any future occasion we would devize tests which would show the participants that their attendance was of measurable benefit to them.

CHAPTER 1.

MAN AS AN ACQUIRER OF KNOWLEDGE: MODELS AND FACTS

THE INTELLECTUAL DEVELOPMENT OF CHILDREN: A DIVERSITY OF VIEWS

Before we are to be able to describe and explain the changes that occur as children grow into adults, we must first be able to offer adequate descriptions of human beings at single points in time; to discuss how and why change occurs presupposes a knowledge of what it is that is changing. An examination of one's memories of writings, religious, philosophical, psychological and fictional will serve to remind us of the diversity rather than the unit of views about man and how he works. We lack an agreed and substantiated picture, and yet without some valid snapshot we cannot proceed to expose the cine-film extension of it. This thorny issue must and will be grasped, and to sound a note of optimism, we may find that our presumed ignorance stems not so much from a lack of data as from an inadequate processing and organization of these.

First, let us prune the problem down to asking about man as an acquirer of knowledge, rather than as an eater, sleeper, devotee of Pop music, footballer, postman, president or God's representative on earth. How does he acquire knowledge? Is he active or passive in the process? Does he discover, invent or construct his knowledge? It would be an interesting diversionary exercise to see how the various ancient philosophical traditions reappear in new guises in the approaches to the study of behaviour adopted by contemporary psychologists, but we shall content ourselves with a brief mention of three contrasting views and a slightly extended treatment of two of them.

One main view is the empiricist tradition that offers an 'empty black box' picture of man. This endows him with a susceptibility to have his behaviour modified and his knowledge extended by learning associations. A particularly influential sub-set of believers in the value of this approach emphasises the role of rewards and punishments as factors affecting which associations are learned and acted upon. By contrast, there are views which stress pre-programming. Either knowledge is already there at birth or there are inborn mechanisms so designed that a but minimal amount of experience will render this dispositional knowledge manifest. The Freudian story of psycho-sexual development posited pre-programmed stages of development, each defined by specified consummatory acts to be performed in relation to specific cathected objects. Biologically based determinism has faded recently, but the rationalist philosophical tradition has been resurrected in linguistics. Psycholinguists have provided us with a Language Acquisition Device (LAD) that requires only a little encouragement to enable us to achieve grammatical competence in language (e.g. Lenneberg, 1968; McNeill, 1970).

The philosophical family tree of the cognitive developmental approach, initiated and developed by Piaget has Kant in its ancestry. Piaget emphasises neither the environment nor the pre-programming, but the interaction between the two. The acquisition of knowledge is a process whose products are neither the result of a passive reception of whatever associations the environment forces upon us nor are they simply waiting to unfold. We are designed to be active, and it is through processing information derived from the consequences of our actions that we acquire knowledge.

If we are to decide whether the cognitive developmental approach contains more or less truth about human-beings than the associationist and reinforcement theory of learning, we need to look more closely at what can only be a caricature of the main points of their respective arguments.

Pavlov (1927) demonstrated classical conditioning. Hungry dogs salivate at the sight of meat powder. If other stimuli, such as the ringing of a bell were regularly presented in temporal contiguity with the sight of the meat powder, the dogs would learn to salivate when the bell alone was rung. From this basic paradigm a wealth of knowledge was acquired about such learning. In a separate and mainly American tradition the 'instrumental conditioning' paradigm has relied upon administering rewards or punishments as soon as possible after particular pieces of behaviour have occurred for demonstrating how behaviour can be 'shaped'. The occasion, frequency, timing and nature of the sequences of rewards and punishments (schedules of reinforcement) can be shown to be major determinents both of what is learned and when this learning will be revealed in performance (see Honig, 1966). Debates continue as to whether classical and instrumental conditioning are two types of learning or one and whether learning occurs purely through association and without reinforcements. 'Rewards' and 'punishment' allegedly still evade definition. But it is quite clear that we can manipulate biological states of animals and the environment in which they can then be placed in ways which will enable them to learn. Provided that the actions and discriminations required are within an animal's repertoire (or can be built up), we can manipulate him and his environment to modify his behaviour. An 'almost empty black box' which can be rewarded or punished can have his behaviour changed.

It would be ostrich-like to deny the facts and some of the interpretations accumulated in this learning theory tradition. There is a mass of solid evidence consistent with explanations offered. What worries some psychologists are the attempts to extend the generalizations. For example, without a single empirical study quoted in support of the story, Skinner (1957) sought to embrace the development of verbal behaviour in children within his reinforcement framework. Although he judiciously entitled his book 'Verbal Behaviour' rather than 'Acquisition of Mastery over Language', he did attempt to push his explanations to their limits, and Chomsky (1959) was able to specify enough weaknesses in the analysis to show that the limits were well exceeded.

Similarly, Berlyne (1960) has made Herculean efforts to incorporate Piaget's facts into his sophisticated elaboration of an S-R view of human behaviour, but the domination of the organism by external stimuli leaves us solely as passive victims rather than as active agents as well, a view assumed to be less plausible than the one adopted here (see Figure 1).

While Piaget can escape charges of both excessive nativism and crass empiricism, he would find it harder to defend himself against the accusation that his ideas are difficult to understand. There are simplified accounts which are easy to follow, but these are liable to distort the essence of the theory and diminish its pretended stature. The elementary accounts can of course serve to gain a foothold before one plunges into the complexities of an authentic version (Piaget 1970). The technical terms of the system are many. They are frequently but necessarily defined in relation to each other - as well as to the thinking they are intended to explain. Their meanings are less explicit than will eventually be required. One longs for a large chart setting out the essence of the account, but none is available. Prose must suffice.

The human organism is active in its adaptation to its environment - it is designed in such a way that it accumulates and organizes knowledge of the environment as best it can, within the limits of its intellectual machinery and its opportunities for learning. 'Knowledge' is used in a wide and general sense to refer to a process and not just a state. Hence Furth's (1969, p.2) definition of Piaget's concept as 'the structuring of behaviour as interchange between organism and environment. Knowledge is acquired by the processes of assimilation and accommodation.

Assimilation is defined as:

> 'integration of external elements into evolving or completed structures of an organism'. (Piaget 1970, p. 706)

Accommodation is:

> 'any modification of an assimilatery scheme or structure by the elements it assimilates' (op.cit., p.708)

The relative importance of each in any situation can vary, so that symbolic play is almost wholly assimilation, whereas imitation is almost entirely accommodation. Normal 'intelligent' action involves them both in relative equilibrium.

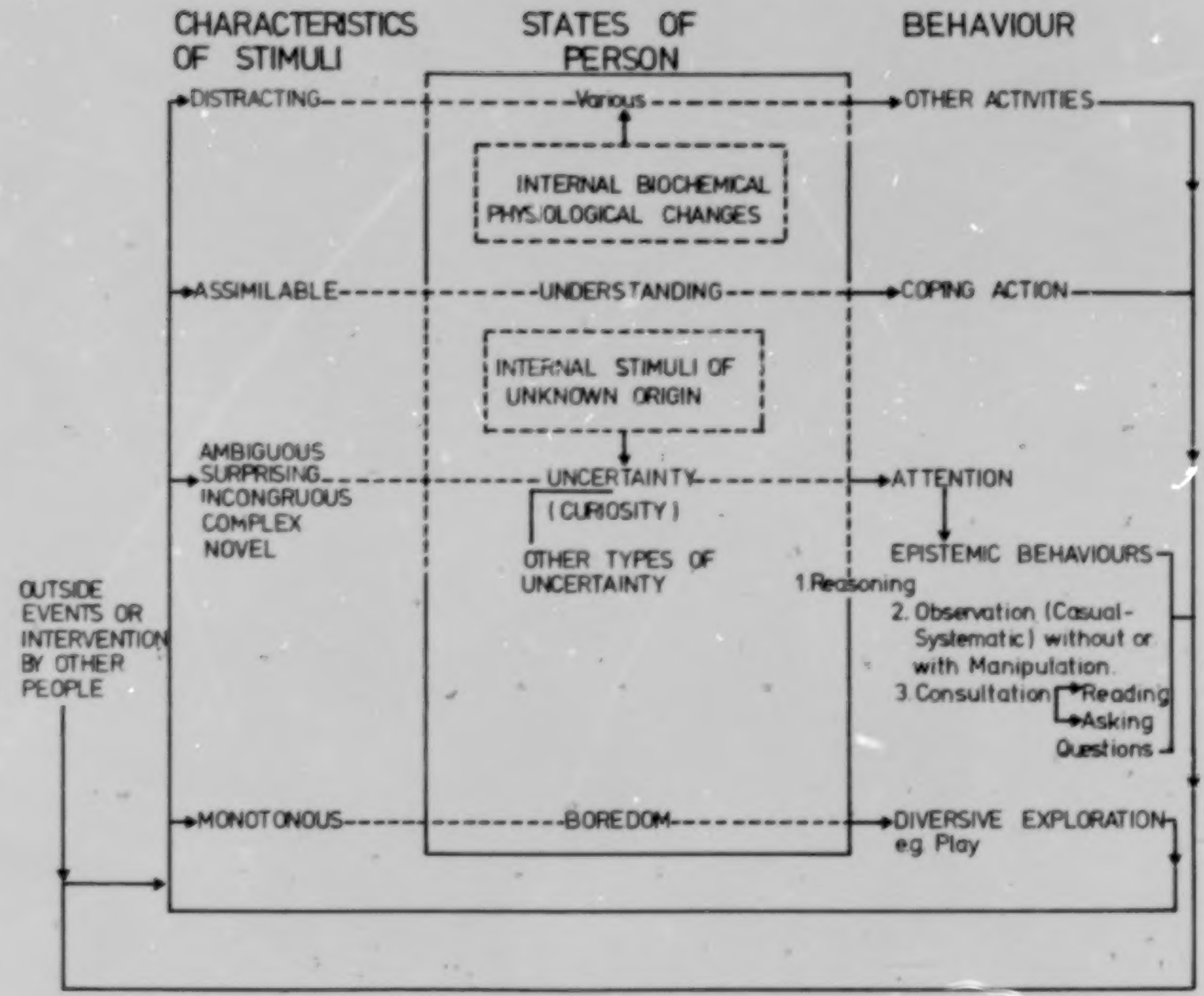
The definition of each process has included the critical words 'scheme' and 'structure'. 'Schemes' can most easily be construed as rules for organizing actions, instructions on how to proceed, computer programmes for processing the data, whether these be generated internally or externally. Beginning with but a few inbuilt reflexes and a general disposition to be active, the neonate builds up many more schemes, that are progressively, but not very systematically, organized into higher-order schemes. For the first two years or so, the schemes are developed and realized only through overt action, but the appearance of symbolic functioning brings this wholly sensory-motor stage to an end. Symbolic functioning means that problems can be worked out in the head prior to overt action occurring. A succeeding three or four year period of 'intuitive' thinking becomes stabilized as a stage of 'concrete operational thinking', which lasts until about eleven. For this stage the schemes at the highest level are relabelled as 'operations', whose own co-ordination and organization are referred to as a 'structure' or 'system'. It is these deep structures about which Piaget has written most, since they involve operations that underpin the logic of our thinking which itself pervades all our symbolically represented knowledge. In 'concrete operational thinking' we can handle problems of identity and reversibility, in classificatory systems both categorical and relational, but the thinking is still limited to the 'real' as opposed to the 'possible' and to the concrete and particular as opposed to the abstract and the general. This latter emancipation occurs only in the 'formal operational stage' (see Inhelder and Piaget, 1959).

Piaget invokes the idea of 'stages' to refer to relatively stable periods where the schemes or structures suffice to maintain a balance between assimilation and accommodation within the limits of the organism's developed intellectual capacity. But why should stages break up? Why should there be development?

Piaget (1970, pp 719 - 726) argues that, neither singly nor in combination, are maturation, experience and the influence of the social environment sufficient to account for the changes that occur in development, and he invokes the concept of 'equilibration' or 'self-regulation' as a solution. Equilibration has the advantage that it will also account for the co-ordination of knowledge derived from the other three sources. But what is 'equilibration'? It 'is a set of active reactions of the subject to external disturbances' (op.cit.p.725). It 'has explanatory value because it is founded on a process with increasing sequential probabilities' (loc.cit.). Such quotations are not intended either to irritate the reader or to denigrate Piaget, but they do seem to be so uninformative that it may be easier to ignore them and to think of ourselves as 'self-organizing systems' who acquire the knowledge we do because the world is as it is and we are as we are. That we arrive at the same logico-mathematical knowledge as each other at the formal operational stage is allegedly because any machine

A Model of Man as an Acquirer of Knowledge.

Fig. 1


CHARACTERISTICS OF STIMULI
STATES OF PERSON
BEHAVIOUR
DISTRACTING
Various
OTHER ACTIVITIES
INTERNAL BIOCHEMICAL PHYSIOLOGICAL CHANGES
ASSIMILABLE
UNDERSTANDING
COPING ACTION
INTERNAL STIMULI OF UNKNOWN ORIGIN
AMBIGUOUS
SURPRISING
INCONGRUOUS
COMPLEX
NOVEL
UNCERTAINTY
(CURIOSITY)
OTHER TYPES OF UNCERTAINTY
ATTENTION
EPISTEMIC BEHAVIOURS
1. Reasoning
2. Observation (Casual-Systematic) without or with Manipulation.
3. Consultation
Reading
Asking Questions
OUTSIDE EVENTS OR INTERVENTION BY OTHER PEOPLE
MONOTONOUS
BOREDOM
DIVERSIVE EXPLORATION e.g. Play

An Elaboration of Berlyne's Analysis of Curiosity, Boredom and Questions.

actively processing the environment we have would be forced to construct the same underlying principles. These principles cannot be discovered because they are not 'out there', but then neither are they invented in arbitrary fashion; they are a 'forced invention.' The empiricist's mistake is to assume the answers are waiting to be discovered. The rationalist's mistake is to assume that we know the answers before we start. The phenomenologist's danger is to assume that what we experience is arbitrary and idiosyncratic. Piaget sees our knowledge as increasingly corresponding to an adaptive construction of reality. Initially knowledge is knowledge because it works; at maturity knowledge is knowledge because it works and is true. If we find it is false or inadequate we change it. Popper points out that the same principles operate in the progress of science (Popper, 1968).
It is in the inadequacy and falsity that the possibility of development resides. Do one's schemes specify a single course of action in a situation? If they conflict or are ambiguous, accommodation is required. Piaget does not use the word 'conflict' often, but this is the easiest term to exploit for conveying the essence of his message. The resolution of conflict evolves new schemes and ultimately new operations that integrate previous knowledge and provide better adaptations to present and future problems.

For example, the child watching balls of plasticene rolled into a sausage eventually has trouble when he realizes he is saying both that there is more after rolling (because it's longer) and less (because it's not as tall), and that these cannot both be true. This conflict is best resolved by constructing the hypothesis that 'It is the same amount because nothing has been added or taken away' - and then testing its validity. This is not in fact how Piaget explains the acquisition of conservation of amount (see Piaget 1970, p.725), but it does provide an illustration of what might happen.

To summarize. For Piaget intellectual growth is active, cumulative and sequential, with periods of inconsistency and muddle moving into relatively stable equilibria, that are themselves broken up, re-developed and re-organized. Succeeding constructions of the world are progressively more powerful in generality and abstractness. At maturity not only are we capable of handling symbolic logic, we are capable of solving any problem sensibly. We can analyse it systematically and can work out contingencies and their interpretations. Our knowledge about empirical and moral matters will have limitations not affecting our logico-mathematical knowledge, but we will know how to find out more.

As with learning theory, so with Piaget; a mass of international data attests to the validity of his own observations. What children can and cannot do at successive stages of development can be described and interpreted; the mechanisms of development are less well understood. What distinguishes the Piagetian story from others is that it could be valid. In principle at least it is a comprehensive and testable story about the intellectual development of human beings in ways which no other ones are.

This is not to say that there are no holes or weaknesses. One obvious hole is the exclusion of interest in all the superficial but nonetheless useful knowledge we acquire; no pretence is made that the system is intended to do deal with anything other than the fundamentals of intellectual development. Piaget has been more interested in basic logical competence than in empirical performance. He has tried to expose the underpinning structure of thinking under optimal conditions with simplified materials. To this extent he presents an ideal to which the conceptual system of man may aspire rather than a summary of how particular human beings stumble around in their everyday lives. He has not been concerned to find out how or why we come to acquire the abundance of low level knowledge we all have, so much as how we could process it, if we tried! Just as the transformational generative linguists have been interested in the child's mastery of basic grammatical structures and not in how he comes to acquire and use the 20,000 or so multiple-meaning words in his vocabulary, so Piaget has looked to see what it is that mature adults can manage in designing efficient experiments rather than in their ability to recite reams of facts and theories in physics. We shall have to concern ourselves with the humdrum as well as the rarefied.

Further, for Piagetian man, life would appear to be an exciting and joyful exploration of the world. For many of us it has strong streaks of boredom and drudgery as we spend so much of our time doing dreary jobs to earn enough money to keep going. But before we worry about these features we need to reconcile the apparently fundamental cleavage between Skinnerian and Piagetian views of man.

A Basis for Articulation.

Which of the two stories is the better approximation to the truth? We have stated that both have so much massive evidence to support them that it will be foolish to argue that either is invalid. There would seem to be little point in persevering with attempts to reduce one to the other. One constructive approach is to recognize that it may be useful to achieve a symbiosis through a distinction between various types of learning problem. For example, Gagné (1967) has distinguished eight kinds of learning and expounds his argument with admirable clarity and simplicity. (His book should be compulsory reading for teachers, even if he does ignore Piaget!) We need not worry about the precise number that should be conceded nor about their exact natures. His list reads:

1. Signal learning.
2. Stimulus - Response learning.
3. Chaining of Stimulus - Response connections.

4. Verbal Association.
5. Multiple Discrimination.
6. Concept learning.
7. Principle learning.
8. Problem - solving.

We can immediately locate the work of Skinner and Pavlov towards the top end and that of Piaget at the bottom. If we wish to be over-simple, we might try to argue that concept learning is the main boundary. Skinnerian work on discrimination has involved the learning of 'concepts', although of course some concepts are more 'difficult' than others. Piagetian work has concentrated on the development of principles and problem-solving, and he has not concerned himself with matters below concepts, except for their foreshadowings in the sensori-motor period of infancy.

We could conclude that which theory of learning one uses to underpin some teaching should depend upon the nature of the learning problem and the present knowledge of the learner. If the problems involve discriminations whose underlying concepts are understood or irrelevant, then principles of association and reinforcement are sufficient. Gagné argues for hierarchical dependence, that, with the possible exception of S-R learning being independent of signal learning, each lower type is a prerequisite of the next higher type. It follows that attempts to teach concepts, while requiring lower-order learning to be successful, cannot themselves be achieved with techniques suitable only for the lower order types. Contiguity, repetition and rewards for right answers will not guarantee a child grasping a concept, but some experience will be necessary for such an achievement.

If we do conclude that Skinner and Piaget are both right within their respective domains of interest, we have to ask about relationships between the two. To simplify the discussion, we will refer to Piaget's learning as intrinsically motivated, and the lower-level kinds involving reinforcement and contiguity will be grouped as response-based. While intrinsically motivated learning is forced upon us by states of uncertainty, Skinnerian response-based learning is linked to contiguity and the pursuit of rewards and escape from or avoidance of punishment. In the first case we learn because that is how we are constructed, in the second it is the consequences that are important. Can and do these different types interfere with each other?

The problem can be posed by asking whether response-based learning can interfere with intrinsically motivated learning? Interference could take several forms: it could slow down, halt, deflect, distort, reverse, or preclude the other developments.

With a little imagination and reminiscence we can see that it is obvious that all these contingencies are possible. Keep a child alive with just sufficient stimulation to prevent his brain going berserk and minimize his opportunities for action - and he could be kept at the lower levels of learning. Prevent movement and eliminate objects from the environment and there would be no content or data for him to work on. Keep him so busy in a controlled environment which dispenses the biological necessities that there is no time for organizing his thinking and he could be wholly dominated by reinforcement schedules.

Not only might we construct an environment deficient in materials and data to work upon, we could also devize ways of preventing his knowledge-acquiring tools and programmes from developing. We could presumably also render developed schemes and operations inoperative with an appropriate dosage of aversive conditioning. Properly arranged electric shocks coincident upon attempts to find out about the environment should be manipulable to ensure that sufficient anxiety is generated by the mere thought of such endeavours to discourage their pursuit.

While the immediate reaction may be one of jocular rejection of the idea that such contingencies are in fact realized, we shall at least have to ask whether, however unwittingly, this is just what does happen to many children and adults. When one begins to examine the extent to which incentives and sanctions pervade our society, the possibility may be seen to be less absurd. Nation states, ideologies and religions can maintain their stability by discouraging and preventing criticism and examination of their principles of justice, reasonableness and distribution.

A Model of Man as an Acquirer of Knowledge.

If we attempt to incorporate Piaget's theory into a more general model of man as an acquirer of knowledge we may end up with a representation something like Figure 1, which is an elaboration of Berlyne's model (1960). This begins to give substance to Piaget's processes and locates them in a more complete being.

Stimuli arising in the outside world are classified into four types of which two are immediately related to the acquisition of knowledge. Assimilable stimuli are those for which currently held schemes will suffice to yield coping actions. They provide further knowledge because they can include new instances of classes already coped with; this is knowledge extension by generalization. Ambiguous, surprising, incongruous, complex and novel stimuli are those cited by Berlyne (1960) as productive of uncertainty. While the five categories may require refinement and regrouping, they do help to give substance to Piaget's more abstract notion of features requiring accommodation. All are assumed to give rise to uncertainty. Curiosity is one kind of uncertainty. In fact it is the only one mentioned, although 'anxiety' or 'worry' might also be candidates for inclusion. Curiosity leads to attention. It may be that a dose of active exposure will in itself enable the person to assimilate the stimuli to a scheme or set of schemes. Otherwise he will have to reason, observe or consult to eliminate the uncertainty and to render the stimuli rendered assimilable. He may fail because he is distracted before a solution is reached or because the stimuli become monotonous. A profound absence and an excessive bombardment of stimulation or an excess of repetition will result in boredom and diversive exploration. Distracting stimuli are any that switch the person away from the problems in hand. All stimuli can only be defined relative to the present knowledge and state of the person receiving them.

The two sets of internally arising stimuli are inserted into the diagram to complete the picture. Bio-chemical/physiological changes cover all those diurnal and other metabolic cycles and their associated signalling systems that regulate our biological well-being. They embrace those factors that give intensity to emotional experience and which interact with interpretations of outside stimuli to result in pain, anger and compassion. 'Internal stimuli of unknown origin' are the stuff that dreams are made on, the fantasies created out of boredom, and the deliberately chosen problems and their solutions where no external influences appear to have relevance to them.

Uncertainty presupposes ignorance, and understanding presupposes knowledge. Both knowledge and the mechanisms of knowledge acquisition are omitted from the diagram. If we were to include and unpack 'knowledge' it would have to list all content of all kinds expressed in each manner possible. Sensory-motor coordinations, the capacity to draw maps of towns and countries, the realization of the ability to defend the judgment that what is morally wrong can never be politically right, all multiplied to everything we can manage - this gives the framework for uncertainty or understanding to occur.

The schemes, operations and structures are the mechanisms of knowledge acquisition. Traditionally this would be referred to as SECOND ORDER knowledge. FIRST ORDER knowledge comprises both 'knowing that' and 'knowing how' where these are directly related to the substance of the environment and ourselves. SECOND ORDER knowledge comprises the machinery for acquiring and processing new first order knowledge - knowing how to find out. But Piaget has argued and shown that this machinery not only acquires first-order knowledge, it changes and develops its characteristics and capacities - it is acquiring knowledge about how to acquire and process knowledge. Such an important device deserves a name, and following the linguistic precedent of LAD for Language Acquisition Device but rejecting the type of content envisaged, KAD for Knowledge Acquisition Device is the obvious first choice. It is the growth of the operating principles of KAD that Piaget's concepts are applied to. The rise of skills in posing questions and the capacity to evaluate answers is one realization of its activities.

We have raised the possibility that the development of KAD can be interfered with by a manipulation of both the structure and the content of the environment, and by the human use of sanctions. It is time to give substance to this argument and to transform the imaginary examples into a realistic portrait of the development of children and the socialization procedures to which they are exposed. We do so through a review of social class differences in child rearing with especial reference to training in the use of language. Language is chosen rather than cognitive functioning in general because this area has attracted much attention and because we have eventually to return to the acquisition and transmission of verbally mediated knowledge expressed in questions and answers.

How is language used by whom?

Schatzman and Strauss (1955) interviewed MC* and WC respondents about a tornado which had struck their town. The undocumented conclusions were that WC speakers were more likely to retail events only from their personal perspective; they did not accommodate to the fact that the interviewer had not been present during the tornado, they referred to 'we', 'they' and 'persons' without identifying these individuals or groups further; information given was concrete and particular; the stories were narratives that digressed unsystematically. The neat metaphorical image used to sum up the WC speaker is of someone who has shot a cine-film which is replayed and commented upon - with no awareness that the audience cannot see the film.

By contrast MC speakers shifted perspective from their own to those of other individuals and groups; attempts were made to set the account in terms that would be meaningful to the listener; references were made explicit; information transcended the particular and concrete to include roles and organizations; stories were coherent, and sub-plots introduced did not result in a loss of the theme.

One cavalier interpretation would suggest that the MC observer has behaved as a self-organizing acquisitor of knowledge, processing events in situ, and gaining an objective view of reality which he has represented at various levels of abstraction. At any later point in time he is able to cut through the coordinate store of knowledge in one or more of many ways to select relevant information and communicate this to listeners of varied knowledge. The WC observer has been passive, his perceptions influenced mainly by the strength of impinging (distracting?) stimuli, the information left in ikonic form. When he tries to meet a demand for the retrieval of this knowledge, he relives snippets.

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* MC will be used to refer to Middle Class, WC for Working Class, L for the lower and U for upper subdivisions of each, UWC refers to skilled working class.

The indignant defender of the working classes breaks silence to point out that the MC speaker does not know how to tell a story. The ordered dullness wreaks of a bureaucratic administrator. The WC account is vivid, dramatic and its unordered vigour can arouse what it is like to be in a tornado.

These initial polarizations are not intended to be dogmatic assertions of final truths about either the facts or their best interpretations. If we take the factsat their face value, we can see that several interpretations are consistent with them. The differences found could be but artefacts of the problem posed and of other features of the interview situation. Perhaps the same differences would be found across a variety of situations, but still reflect nothing more than different preferences for ways of relaying information or different assumptions about the knowledge already held by listeners. There are other possibilities. The differences could reflect genuine differences in verbal skills. Perhaps WC observers processed events in the same way as MC observers, but did not have the verbal resources for expressing their knowledge. Their retrievable knowledge may have been less because they did not happen to have processed events as thoroughly as MC observers, but could have done if they had chosen to do so. Perhaps they could not have processed the information in the same way.

Hence the differences could have arisen from psychologically trivial matters of differential interpretations of the task; from differences in in verbal facility or from differences in knowledge - acquiring skills.

The study of Schatzman and Strauss does not allow us to decide which of these possibilities is most likely to be true, and the last decade has witnessed much argumentation as to the most sensible answers to such questions (see Ginsburg, 1972; Williams, 1970). Let it be stated at the outset that the answers are not known and that, like much academic wrangling, the disputes have been based on mutual misunderstandings of what others are trying to say, an absence of both hard data and adequate theory, and an intrus ion of personal and political values.

Values must intrude into discussions of educational practice and it may be as well to state our basic premise. Any educational system should be designed to maximise the chances of as many children as possible becoming as capable as possible of acquiring and evaluating for themselves that knowledge necessary for being a full member of their society. If 'society' is taken to mean 'mankind', so much the better. In educating children we can choose what kind of mistake we wish to make; we may believe they can learn when they cannot; we may believe they cannot learn when they can. If we accept the moral principle suggested, we are obliged to try to find ways of teaching children what we think it is important for them to know rather than to write them off as too stupid or feckless to learn - which is not to say we should persist into cruelty.

As a matter of educational practice we may attempt to improve the performance of WC children by thinking about and changing contextual variables to render verbal communication sensible from the child's point of view. If we fail to devise ways of improving performance by switching contexts, we may decide to teach the verbal skills. If this appears to be difficult because of a lack of underlying cognitive structures we may have to provide experience for the structures to develop. In short, we can take the teaching problem down from the superficial to the deep, from preference to competence, from speech to cognition as and when this is proved necessary by failures to teach. The production of programmes that could have enabled the adoption of such a policy might have been more useful than the arguments about differences and deficits already referred to.

We shall not become bogged down in debates about genetically based differences in general intellectual capcity. The interactional view of child development adopted here has to argue that the sums used to propound proportions of heredity and environment are a wrong-headed approach to problems of intelligence, but allows for the possibility of genetically based individual or class-linked differences in intellectual potential. It focuses rather on what this child may be able to learn given an optimal arrangement of the environment rather than upon how he differs from some other child.

Neither shall we pursue the hoary old problem of the relationship between language and thinking. Alas, this problem is often posed at such an abstract and general level that answers given are either platitudes or over-generalizations. We shall merely point out that it is as absurd to think of a child as educated, if he achieves Piagetian formal operations without being able to speak, as it is to contemplate the same conclusion for the converse case. The relevance of a mastery of units and structures of language to problems will vary from problem to problem, for some they will be irrelevant, for others vital (see Robinson, 1968). It is very likely that for efficient learning of much knowledge there can be facilitative interaction between linguistic and non-linguistic representations.

But it is about only one function of language that we shall be particularly concerned. In the instance reported by Schatzman and Strauss we have pointed out that the WC speech could have the effect of being more moving - it could affect the emotional state and perhaps the behaviour of the audience. But the MC account is more efficient as a representation of what happened. This representational function of language is that which enables the extra-linguistic world to be represented symbolically. When language is used to make statements whose truth or falsity can be called into question and evaluated, it is being used representationally. The MC speakers were transmitting their knowledge about the world to someone else who could gain knowledge he had not experienced directly. The effective use of this function is something to which all developing human beings might reasonably aspire. If members of the working classes are less proficient in this use than members of the middle class, this is their loss as human-beings. To educate children into this use is not to make them middle-class, but into educated adults.

In several ways the WC speech as described by Schatzman and Strauss is reminiscent of the language use and thinking of young children - egocentric speech for oneself used as a private commentary upon action, concrete, particular, inexplicit, lacking coherence. These are all aspects of speech noted by Piaget (1926) as symptomatic of the thinking of children between three and eight years old.

A favoured explanation for the characteristics of WC speech is that the demands made upon speakers by the environment do not require verbal explicitness. Talking takes place in a context of such heavily shared and valid assumptions that there is no need for explicitness, order or abstraction. This may be true but it will not suffice. It does not explain why interest should be confined to matters that can be talked about in this way. Games of football can be discussed as abstractly as games theory. Matters of empirical fact, problems of right and wrong, matters of religion, aesthetics or politics are (or should be) finally independent of the 'social class' of the discussants. This is not to suggest that members of middle classes are particularly proficient in handling knowledge verbally (we are all woefully inept), but they are perhaps somewhat more so than those of the working classes.

The question of the links between social class and language use were taken up with vigour and dash by Berstein (see Bernstein, 1972 for collected papers and Lawton, 1968 for a critique of the development of the ideas). His thesis that members of the lower working classes are generally confined to a 'restricted code' of language use, while members of the middle classes have access to an 'elaborated code' as well ignited the debates already referred to. While recognizing the value of his conception of 'codes' and their sociological relevence, it may be easier to understand the problems if they are posed at a psychological level, while retaining 'social class' as a useful locational variable.

If we do this, 'social class' can immediately be seen to have no causal significance. Children's verbal behaviour will be affected by their genetically endowed capacities and dispositions interacting with their opportunities for learning. What the environment makes available to the child will affect his learning. Mothers often have considerable control over what is made available. What they choose to make available or are able to will be constrained by their resources. If we pursue this stepwise succession we shall arrive at some stage at 'social class'. and this can then serve to locate general differences in what is made available for children to learn and why. But in itself it causes nothing.

It has proved to be a useful concept for sociologists discussing broad similarities and differences between sections of the population; it can be very useful to psychologists as a primary source of contrast. If we can find important differences in children that are linked to class and if we are able to associate these empirically and theoretically with differences in opportunities and treatments afforded by mothers of different social classes, we may be able to transcend class itself and offer more general explanations of associations between the behaviour of children and their mothers. This does not mean that 'social class' is of no more interest than as a useful starting point for showing where differences might be. It may also be of relevance to educational practice.

However it is to the mother's behaviour we look as a possible source of explanation for children's behaviour, not because she is all-important but because in our society she is normally the major immediate controller of resources for the learning of young children. There is much we shall omit - what is provided physically, what is provided emotionally. The problems are relevant to intellectual development, but must be outside our present purview.

CHAPTER 2.

THE QUESTION-ANSWER DIALOGUE BETWEEN MOTHERS AND CHILDREN.

We examine only three aspects of the mother's role - the mother as prescriber, informer and motivator. While the validity of this separation has limits in practice, it may be conceptually helpful. As prescriber the mother defines what is and what is not appropriate behaviour. As informer she makes knowledge available for learning. As someone who punishes and rewards she may be able to influence the intrinsic and extrinsic motivational characteristics of the child. All three activities may involve the use of language. First, however, it may be instructive to view her apparently playing all three roles at once - as a teacher.

Mothers as Teachers.

Hess and Shipman (1967) had negro mothers of different social class groups teach their four year old children how to sort blocks on two of four dimensions at once and how to cooperate in the etching of five patterns on an 'Etch-a-Sketch' machine. The analysis reveals a certain looseness in methodology. In several calculations variables of different kinds are bundled together with little consideration as to how they might operate to facilitate children's learning. There is no explicit plea that, since this was one of the first attempts to relate maternal and child behaviour directly, we should perhaps be agreeably surprised that any associations were found rather than disappointed that the entire variance had not been located and explained. Ginsburg's (1972) attacks on the data and their significance gain unjustified strength from these and other weaknesses.

A first point to make is that maternal activities relate both backwards to social class and forwards to the children's behaviour. Control strategies appealing to authority (because I say so) were relatively more frequently used by

WC mothers, while those to feeling and reasoning were more common among the middle class. Children's scores on the sorting task were significantly correlated with these control strategies. Alas, there were no correlations calculated to partial out or otherwise control for the social class effect. Similarly, Hess and Shipman examined relationships between eight interactional 'teaching' variables backwards to social class and forwards to children's sorting scores, again without controlling for class. Although MC mothers did not give more information than WC mothers in teaching their children how to sort, they did indulge in more attempts at motivating and orienting, they demanded a higher ratio of verbal to physical responses from their children, they required more specific discriminatory speech, and they gave more positive than negative 'reinforcement'. By 'reinforcement' Hess and Shipman in fact mean 'knowledge of results', e.g. 'That's right' and'That's wrong'; an unfortunate shoddiness of word usage which could be misleading.

Four of these variables were associated with children's success in manipulating and justifying their sortings: orienting, requiring specific discriminatory speech, seeking verbal responses, and not seeking physical responses.

In the 'Etch-a-Sketch' task Hess and Shipman found that MC mothers gave more precise and specific verbal instructions during both the allowed practice and the production periods, and in addition, they showed their children more of the designs to be copied. These three scores gave a multiple correlation of 0.64 with an assessment of success in the copying of the mother-child team. Adding social class and the intelligence test scores of both mothers and children to the calculation raised this correlation by 0.03 only; by themselves these last three correlated 0.47 with etching success. (Ginsburg omits to report these results). It can be claimed that the task-instructional variables are better predictors of performance than the background or general intellectual variables.

As we have already argued, 'social class' can only operate as a locating index for studies of child development. Mothers' intelligence test scores may serve as an indication of a limiting parameter on what she can do by way of providing opportunities to learn. Children's intelligence test scores may mark some limit as to what they can presently understand or learn. Neither reveal what is made available for learning nor how this relates to the current knowledge, knowledge acquisition skills, or the interest of the learner.

Where Ginsburg is impressed by failure, a more detached approach might be surprised at the extent of success. Attempts to pin down efficiency of instructional techniques of mothers through a task analysis (Brophy, 1970) led to a better appreciation of the important differences between the behaviour of MC and WC mothers, but, incomprehensibly and infuriatingly, this was not succeeded by an examination of the relationship between teaching techniques and children's learning. Hess and Shipman concluded (p.79)

> The lack of meaning in the communication system between mother and child is clearly exemplified in the behaviour of many of the mothers on this task. Consider the plight of the child whose mother is low on these three measures: During the practice period, his mother demands that he turn his knob, but she fails to explain why or to relate it to the lines on the screen. During the task she doesn't show him the models and fails to give specific turning directions. For such children, the effects are these, (a) The child is not given a goal to make his individual responses meaningful (that is, he is not shown the model). (b) The mother is not specific in her directions; each new response is essentially a guess. (c) The sequence and

pattern of response is not explained. The child has no way to tell ahead of time how to respond, and even after he does respond, he cannot predict the mother's reaction. He is hindered in learning anything from one response that will generalize to the next. (d) Nevertheless, his responses are being rewarded or punished, usually with maternal praise or disapproval, which provides belated feedback for a particular response if the mother is not giving specific directions. In either case, reward or punishment performs a motivating function.

As a result of the interaction of these factors, the child is being made to produce responses that from his point of view are not related to any visible goal, are unrewarding in themselves, and do not bring corrective feedback that will enable him to avoid punishment.

Nevertheless, reinforcement continues, and punishments are usually more frequent and intense than rewards. The parallel between this state of affairs and the experimental designs used by Maier (1949) deliberately to produce frustration in subhuman organisms is strikingly consistent.

One can sympathise with Ginsburg's protest that the data are not strong enough to allow the conclusion that 'many of the mothers', especially those in the lower working class, offer blue-prints for the development of chronic frustration. It is true that the numbers in the columns of the tables hardly capture the atmosphere of purposeless meandering that is immediately conveyed in a film presentation of one of their working class mothers 'teaching' her child; the child did look very puzzled at the vague chaos. But under (d) above it is suggested that mothers are rewarding and/or punishing strongly.

The account gives an impression of maternal involvement spilling over into smackings and snarlings, which is not what one would normally associate with their examples of negative reinforcement, e.g. 'That's not right, and 'No, this is a tall block.'

While their interpretation would fit the story advanced here of a LWC emphasis on response-based learning mediated by punishment, the results do not warrant this extension. We need to see when and how real punishments and rewards are used in such situations before we can make claims about that issue. On the other hand, we can point to the absence of structure for LWC children; tasks not defined and models not shown, should make learning for them more difficult. Opportunities afforded for learning are fewer in the LWC, and the 'Etch-a-Sketch' data in particular imply that provision of assimilable knowledge is what is important for success by the children. Mothers making efficient use of the representational (as well as the controlling) function of language have children who are not only more efficient performers, but are more articulate in justifying their performance as well. These motives are more likely to be found among the middle class. They are providing first order knowledge in assimilable form and doing nothing to deter KAD from developing.

Mothers as Prescribers.

Mothers define what is acceptable and unacceptable behaviour in their children. These definitions can differ in their explicitness and basis of justification. There are many ways in which this problem can be broken up (see Hess, 1970, for a review), but our brief exegesis will rely mainly on the analysis by Cook-Gumperz (1973) of the responses of five year old children and their mothers in Bernstein's London sample.

Mothers can reward or punish children directly, with no verbal explication of what for or why. These sanctions may be non-verbal (material rewards, smiles and kisses; smacks, scowls, forcible removal into and out of situations), they may be verbal (well done! good boy! stop that! shut up!). There may be an explicit verbal or non-verbal reference to what has occasioned the mother's behaviour (smile + 'what a clean plate'; 'stop that!' + pointing at unacceptable behaviour.) A direct sanction may be substituted for by a promise or threat. Such interventions state no rules; specific actions and non-actions of the child are contiguous with pleasant and unpleasant actions and threats of action by the mother. No reasons are given. The mother's verbal behaviour is used to control behaviour directly or to define contingencies.

If we think about what is made available for the child to learn through these events, we can see he can be in much the same position as one of Pavlov's dogs or Skinner's pigeons. He has to work out what rules are operative - if any are. This might be easy, but it may also be difficult or impossible. In terms of Gagné's analysis, the learning is signal and S-R learning; the child is not encouraged to analyse the contingencies nor to work out 'concepts' and 'principles' underlying rewards and 'punishments'.

But specific actions may be given more general and precise labelling, 'Don't spit - not on buses anyway!' Not only the actions, but who should or should not perform them may be mentioned: 'Children should be seen and not heard'. Cook-Gumperz's coding frame emphasises the rules of this kind which are generalised to broad status-based categories of persons: sex, age, familial roles, etc., but she does not elaborate about the generality or limitations of the actions themselves. They are called 'positional appeals' - because they are made relevant to individuals only as occupants of positions in the social structure.

Such appeals are necessarily mediated verbally and the function of the language used is to define role appropriate behaviour. The definition of roles and the previously mentioned attempts to control behaviour directly are the prominent functional aspects of Bernstein's 'restricted code'.

> 'The major function of this code is to reinforce the form of the social relationship (warm and inclusive relationship) by restricting the verbal signalling of individuated responses.'
> (Bernstein, 1972, p.78)

'Positional appeals' can serve as guides for proper conduct. They can be learned and provided that they do not give rise to experienced contradition, can serve as concrete prescriptions for behaviour. They link concepts associated with broad status-based categories to particular behaviours. In Gagne's terminology principle learning is involved, although we should prefer to say it is rule learning. (It is more common to use 'principle' as a higher order concept than 'rule'; i.e. rules can be further explained or justified by reference to principles.) The 'rules' here are not justified at a succession of higher levels. These rules can be generalized to new problems by noting similarities to old ones - they give rise to case law based on precedent. They do not explicitly encourage thinking about discipline problems.

Reasons for rules can be given. These appear in the 'personal appeals' of Cook-Gumperz. They differ from positional appeals in two ways. Firstly, there is a switch in the nature of the persons to whom reference is made; individuals are substituted for positions. Appeals can be directed to mother, father, child or Mr. Jones - 'You should not spit!' Secondly, the basis of the appeal can be stated - 'You should not spit because it spreads diseases', 'You should not spit, because it makes me angry'. Reasons can refer to consequences of different kinds. Cook-Gumperz mentions those that identify emotional states of specified persons and behavioural consequences for them - 'Someone will have to come and clean that up'.

Once an appeal contains reasons, there is the beginning of a deductive potential for the recipient. It happens to be the case that some reasons used are of considerable generality leaping to a universal morality independent of persons, e.g. 'Because you should never hurt other people'. It is logically possible for such ideas to be incorporated in positional appeals, but whether they are or not has yet to be examined.

'Personal appeals', as defined by Cook-Gumperz also begin to incorporate empirical matters into moral problems. Facts are given to justify demands. Complicated personal appeals can be short lectures on social psychology or physics. The giving of such reasons might serve to encourage the child to think analytically about appropriate behaviour in new situations rather than to search his memory for a relevant rule. They should encourage him to integrate moral and empirical knowledge.

Rewards and punishments are not mentioned in either positional or personal appeals. In the former, rules are announced, while in the latter they are given some justification as well.

Such appeals represent problems mainly of principle learning and problem-solving, anchored however to particular instances. No doubt these occasions may often involve punishment (and/or reward) as well. Without knowing how appeals are combined with response-based learning factors in actual situations we cannot comment on how appeals might be relevant to children's learning. Personal appeals in combination with effective sanctions could give rise to a peculiarly strong rational morality backed with emotional force. Personal appeals used relatively independently of sanctions might give rise to the emotionless intellectually compulsive morality of a child Kant.

This unscholarly snapshot must suffice to illustrate the problems, which, in spite of many years of alleged professional interest in maternal discipline, have still not been accorded thoroughly systematic analysis.

Most reports of social class differences emphasise the relative prevalence of direct control of behaviour and the relative absence of personal appeals in the working classes. (Hess, 1970). Cook-Gumperz (1973) collapses her coding frame in an undeciferable manner, but it is clear that for the London mothers of the five year olds she examines, several kinds of personal appeal were more common among MC mothers. MC mothers reported using more child-oriented personal appeals and they alone used the complex behavioural affective appeals. By contrast, LWC mothers more often used 'imperative' methods of control, which correspond roughly to the first category mentioned. The classes did not differ in the incidence of positional appeals. The similar social class differences reported by Hess and Shipman working with Negro mothers of slightly younger children in Chicago have already been mentioned.

Initial conclusions might be that LWC mothers are prescribers who do not use language to justify their prescriptions and controllers who try to achieve their ends with sanctions, while MC mothers are using language representationally, not only to set up rules and reasons, but also to individuate, generalise and abstract these rules; they are providing the child with data that should help him to generate his own moral theory. This may well be so, but limitations to this idea need to be mentioned. Both studies mentioned were only concerned with the negative side of control. All Cook's problems involved naughtiness and punishment rather than goodness and rewards. As we shall see in the section on sanctions, the working class have no monopoly of control through their use.

The content of prescriptions has been ignored. While such a lack of substance may make it easier to appreciate the consequences for the general intellectual development of the child, it precludes a thorough understanding of what is happening. For the foci of interest here it would be particularly helpful to know what mothers of different social classes prescribe about finding out and talking in general and about question-asking in particular. If question-asking or finding things out are themselves proscribed effectively then KAD should cease to develop. At present we just do not know what mothers (or teachers) do.

Cook-Gumperz did proceed from a consideration of social class differences in maternal control strategies to an examination of social class differences in children's perceptions of adult control strategies. She tried to link both to her operationalized definitions of 'elaborated' and 'restricted' codes. While this analysis is pursued in great detail, crucial methodological flaws preclude useful interpretations. Sheer verbal output of mothers correlated so highly with varied indices of code and strategies, that the rest of the analysis is rendered void. The consequent failure to find evidence of the existence of 'restricted code' mothers may do Bernstein's original thesis unwarranted harm.

Although Turner (1972) did not look at maternal speech, his careful linguistic analysis of children's spontaneous descriptions of control strategies to adults in a story-telling activity did reveal social class differences like those found between mothers. The simplest hypothesis would claim that, within the limitations of their intellectual development, children had assimilated what had been made available for them to learn.

Mothers as Informers.

Although maternal prescriptions are information of a kind, particularly about the social world, it is helpful to contrast knowledge about proper behaviour with knowledge of fact. Many remarks made by mothers to their children, or in their presence, assert propositions whose truth or falsity can be questioned. Does the utterance correspond or fail to correspond to a feature of the extra-linguistic world? Is the cat sitting on the mat? There are rules for evaluating the truth or falsity of empirical statements. We looked at the answers mothers said they would give to certain questions supposedly asked by their five year old children (Robinson and Rackstraw, 1972; Robinson 1973). Relative to MC mothers, LWC mothers were less likely to answer questions asked, their answers contained more inaccuracies of fact and they were less likely to stress that they thought what is said should be true. MC mothers were not so likely to give answers irrelevant (contextual inappropriateness) to the question posed and their answers were organized into sentences that did not have messy additions to the main content. They gave more information (contextual completeness) in their answers. They were more likely to point out similarities and differences between the topic in hand and other topics. In answer to 'why' questions their explanations were more likely to refer to analogies, causes consequences and classification, whereas the LWC mothers showed a relatively higher incidence of appeals to simple regularity (they always do) and repetitions of the question as a statement (because they do.) What are the differences in learning opportunities for the MC and LWC children?

First of all, more knowledge and more accurate knowledge is being transmitted for MC children. The representational function of language is being exploited, not only with a tightness of correspondence between what is said and what it is about, but also with an attempt to order the extra-linguistic world. Categories and relationships are made explicit, both for classificatory systems generally and for causal analyses. If we recall Piaget's description of the intellectual development of children from five to eight, the MC mothers are making available just the kind of knowledge which the child is then supposed to be acquiring. Incidentally of course the child is also learning about the skills of questioning. He has the opportunity of observing how his different questions are differentially treated. The LWC mothers are not so Piagetian. The correspondence between speech and its extra-linguistic subject matter is not so emphasised either by precept or example, less full answers are being provided less often. The heavier use of 'focus on proposition' modes could discourage further questioning. If all 'why' questions get the same answer there is little point in asking them. The absence of empirically relevant content will not either encourage inquiry or add to knowledge.

Here no interest was shown in the extent to which learning in this context might be response-based rather than intrinsically motivated. Punishments and/or rewards for asking questions might be given, and these could be differentially distributed by social class; the problem should be investigated. In our data it was the differential consequences for intrinsically motivated learning that seemed to be most evident.

But are these opportunities exploited by the children? We went on to look at seven year old children's answers to 'wh' questions and found social class differences that are most simply described by saying that they reflected the differences revealed by their mothers, - if one allows for the difference in age and situation. For example, seven year olds gave less information in answer to certain questions than did their mothers. Their answers were generally more immature and egocentric (in the Piagetian sense of the word.) The mothers had been thrust by the interviewer into the role of 'informer', the children were simply telling interviewers what they knew. It may not therefore be surprising that children gave fewer 'Because I say so' or 'Because it is so' responses than their mothers.

While these data are quite consistent with the simplest hypothesis that children's knowledge reflects what has been made available for them to learn, some tighter analysis would leave fewer other possibilities viable. It was possible to extract a limited number of mother-daughter pairs from the original sample and to pursue a further analysis within class. Categories of responses of mothers were re-grouped to give a small number of higher-order categories of which four are immediately relevant. The first, which counted and combined the presence of an insistence that answers should be true with offerings of similarities and differences, the absence of admissions of ignorance of what to say, answers irrelevant to questions, and inaccuracies of fact, is emphasising the representational use of language, its correspondence to the extra-linguistic world. While MC mothers made substantially higher scores than LWC mothers, it was only among the LWC children that there was a positive association between maternal and child answering. In fact the MC girls gave so few irrelevant or contextually inappropriate answers that there was no within class variance to explain within the group! There was a positive association between amounts of information given by mothers and children within the lower working class. Within the middle class there was a strong hint of a negative association which could be used to suggest that mothers may provide so much information that their children become 'overloaded' - and learn less. In both social classes, mothers using relatively higher numbers of 'focus on proposition' modes of answering had daughters who behaved similarly. The use of modes focusing upon matters of fact by mothers had no predictive value for the behaviour of their daughters in the middle class and predicted a high use of 'focus on proposition' modes in the working class. With the exception of this anomaly, the results give further encourangement to the idea that availability predicts learning.

The final investigation in the series (Robinson and Arnold, 1972) moved into direct observation of mothers and children interacting. While Hess and Shipman set up mothers as teachers, we tried to set up children as interrogators. A variety of familiar and unfamiliar objects served as conversation pieces. If we ignore the social class differences, that were in fact generally as one would expect, the data showed identical mother-child associations within class.

The amount of knowledge children proferred correlated strongly with a summary index of maternal behaviour. For the total sample the correlation was 0.67 ($p <.001$, $N = 40$) it was similar in both social classes ($r_{MC} = 0.54$, $p <.001$, $N = 20$; $r_{WC} = 0.66$, $p <.001$, $N = 20$). The summary index was made up of a number of items - the provision of relevant answers, answers which were related to the child's previous experience, answers which went beyond the question asked; the pointing out and correction of errors in what children said; and the affirmation of the correctness of statements by the child deemed to be correct.

This index did not relate only to the knowledge of the children, but to their questioning as well. The number of syntactically complex questions asked by children correlated 0.43 ($p <.01$) with the index, the number of questions overall 0.69 ($p <.001$). For the two social class groups the degree of association was similar ($r_{MC} = 0.80$, $p <.001$; $r_{WC} = 0.76$, $p <.001$). Mothers who were providing clear structuring, making materials relevant assimilable and challenging, had children who were curious and proficient in the verbal expression of their curiosity as well as knowledgeable. Both first and second-order knowledge was greater; KAD was more active and more developed.

Interestingly enough, direct maternal attempts to focus attention or to arouse curiosity through posing questions bore no relationship to the children's behaviour.

Children would feed on food provided, but appeared to be uninfluenced by the chef's recommendations.

We took these results to be strong evidence for the importance of the provision of structured knowledge as a determinant of children's knowledge (and curiosity as well). That mothers' attempts to motivate children had no relevance to questioning or answering is consistent with the finding of Hess and Shipman that there was no association between the motivating efforts of mothers and children's success in placing or justifying the placing of blocks in their Block Sorting task or their scores on the Binet IQ test. Both Hess and Shipman and Robinson and Arnold found that MC mothers were more likely than WC mothers to try to motivate. In a field of enquiry remarkable for the dreariness with which one has to report that WC mothers are 'getting it wrong', it is almost a relief to find a MC propensity that apparently has no value.

It does look as though at last we are beginning to be able to specify some of the maternal (or teacher) behaviours relevant to the intellectual development of children. Our data were not intended to probe the general depths of intellectual functioning. We were not concerned with the fundamental operations of Piaget. But we were concerned with general knowledge of the world and its verbal representation, both in terms of its acquisition through questioning others and its retrievability both for others and presumably for the children themselves. While it is true that MC mothers were generally employing techniques more conducive to the intellectual development of their children, variance within class could be located and exposed. Structuring and presenting an almost assimilable environment and mediating this through a disciplined use of the representational function of language appeared to be relevant for children's growth of knowledge.

Mothers as Rewarding and Punishing Agents.

We have encountered evidence to link differences in knowledge manifested and questions asked by children to differences in knowledge made available by mothers. The correlations were sufficiently fat to make us think we had progressed beyond statistical significance to psychological importance. The emphasis in the studies was on intrinsic rather than extrinsic motivation. We generally ignored rewarding and punishing and their consequences.

Can we really separate intrinsic and extrinsic motivation? If the argument being advanced here is to be sustained, we shall even have to distinguish between 'That's right!' and 'Well done!' and between 'That's right!' said with a smile and a cheering inflection and 'That's right!' uttered in a dull monotone. 'Well done!' will often presuppose correct performance and a flat 'That's right!' may give its receiver cause to pause, but the theoretical distinction will be vital. Perhaps the common coincidence of the two makes it easier for children to be seduced away from learning right answers to learning pleasing answers.

Is this not being academically petty? Two kinds of study show that it is not. There are those which show how the introduction of external incentives, such as money, into a situation obliterates differences in performance attributable to intrinsic motivation. There are studies which show that there is differential responsiveness to words like 'Good' as opposed to 'Right' - and that this varies with social class.

Can the extrinsic incentives lead children away from the pursuit of knowledge for its own sake? It seems to have been so obvious that they can, that nobody has bothered to examine the problem, but we can note two approaches to the matter.

Over the last two decades there has been much interest and effort expended in the investigation of 'the achievement motive'. This is defined in terms of a concern to perform well in relation to a standard; this standard is normally assumed to be independent of the judgements of others. Satisfaction derives from doing well, and if goals are achieved, new and more difficult goals are then set. This motive may be seen as an effective relation to the cognitive conflict model of development; 'doing well' substituting for 'knowing'. Individual differences in achievement motive have been shown to relate to differences in standards of performance adopted in many tasks - provided that external incentives are not introduced (see Chapman & Hill, 1971 for an extensive bibliography). Once they are, performance is affected by them. These investigations show quite clearly how external and intrinsic factors can be made to have differential influences according to how the situation is manipulated.

While we can readily conceive of behaviours being encouraged and discouraged by the manipulation of rewards and punishment, a case of especial interest is that of inquiry behaviour themselves. Only one study could be found: Deci (1970) found that the interest of students in performing intrinsically rewarding tasks, such as solving mechanical puzzles and writing headlines for college newspapers, fell off after money was introduced for doing them. What price capitalism if the introduction of the notion of monetary value destroys the intrinsic satisfaction associated with performance? And yet if we think about it, this is almost certainly true. The professional performer on the violin, tennis court, or stage has an interest in more than simply doing well. How can he be involved in the performance night after night, week after week? The conclusion is not necessarily to the effect that performers should not be paid, but to note that professionalism may exact its price. That one may lose interest because one is paid is an hypothesis that urgently requires investigation in our society. It is, of course, consistent with the tenor of the argument advanced here, that external incentives can usurp control over intrinsic motivation.

Neither of the two discoverable experiments linking social class to differential sensitivity to words of praise or confirmation are strong enough to prove anything, but they do show that there is a problem to be investigated. Zigler and Kanzer (1962) had seven year old children drop marbles into either of two holes. They established the natural bias of each child and then watched to see how this changed as a result of the experimenter saying 'Good', 'Fine' or 'Right' to droppings on the child's non-preferred side. While WC children showed twice as much shift in response to 'Fine' as they did to 'Right' MC children were much more responsible to 'Right' and 'Correct'. All utterances were allegedly made with an 'equal amount of enthusiasm', but Brooks, Brandt and Wiener (1969) doubted this, repeated the investigation, and failed to obtain the same results. Their children showed no discrimination between praise and confirmation. Instead of checking the reasons for this, the authors went ahead with studying the effects of variations in words and their inflections, all spoken by a Language Master. The marble dropping became a 'Space Game'. As one reads of the elaborations and refinements, an uneasy sense of unreality begins to grow; it is all too scientific and removed from breathing children trying to do something they see to be sensible. However, the results are provocative. MC children showed no 'learning' when the inflection contradicted the word content (e.g. 'right' said as though 'wrong' were intended.) WC children learned nothing when the tone of voice was neutral (non-inflected.) MC children modified their preferences most in response to an uninflected 'bad' or 'wrong' and roughly equally to congruently inflected words and uninflected 'right' or 'good'. WC children switched their choices most to properly inflected 'good', next most to incongruent conjunctions, and least when presented with properly inflected 'bad'. Could it be that both MC and WC children are most responsive to the type of comment they experience least frequently?

It may be safer not to interpret these results until further studies along similar lines have begun to give some stability to the findings. Both experiments are odd in that words like 'right' or 'wrong' were used in a context where the child had no independent evidence of their validity. There were no differential consequences of placing a marble in one hole rather than the other. With nothing but an arbitrary (and person-based) definition of 'right' and 'wrong', it is perhaps not surprising to find children not responding differentially to 'sanctions' and 'knowledge' of results.

At least, however, there is evidence to point to the need to search further. Both studies agree that WC and MC children react differently to identical stimuli. What we need to know is how differently to which stimuli, and whether or not it would be advisable to try to eliminate this difference. The results are compatible with the idea that MC children are relatively more concerned than WC children with getting answers right, and are sufficiently accustomed to doing so, that they are extremely responsive to being told they are wrong in a negatively reinforcing way.

To begin to answer substantive questions about what sanctions of mothers (and teachers) do achieve will require better evidence than is currently available. We cannot just assess whether mothers are generally punitive or generally rewarding. We have yet to specify types and strengths of rewards and punishments, and when we do, we shall find complexities arising because these will have to be defined relative to receivers and not absolutely - at least within limits. We shall need to know not only just what is rewarded and punished, but also the total schedule of rewards and punishments to which each aspect of behaviour is subjected.

At present we can cite studies to show that LWC families are more directly punitive than MC families for the behaviours investigators have chosen to study (Cook-Gumperz, 1973; Newson and Newson, 1971). Certainly the caricature emerges of LWC mothers and fathers being somewhat haphazardly punitive when their children get in their way. A generally laissez-faire attitude to their children's intellectual development combines with unexplained punishments and idle threats associated with status-inappropriate behaviour. If this mixture of apparent indifference and negative sanctions does correspond to reality, it should not be taken to mean that LWC mothers are in fact more generally indifferent to the development of their children. They may well 'love' them, but implicitly subscribe to faulty theories about child development and mistakenly fail to provide them with learning opportunities. They may not be aware that there are more efficient ways of controlling behaviour than delayed haphazard unexplained punishment. It would, however, be foolish to assume that all punishment is administered for the benefit of the children. Not all mothers even want all the children they have, and it is very likely that this is more common in the lower working than in the middle class. Cases referred to governmental and voluntary agencies concerned with child welfare are numerous, and the working classes are overrepresented. At the extreme end of the distribution, seven hundred babies are battered to death each year in Britain.

Just as the receipt of negative sanctions may tend to be the lot of the LWC child at home, so failure may be the modal experience at school - and failure is one form of punishment. While numerous government sponsored or supported projects list the under-achievements of LWC children (see Husen, 1971 for an international review) the heavy incidence of associated boredom is as readily demonstrated (Morton-Williams & Finch 1968; Robinson, 1974). In any competitive system where only a small minority are defined as 'successful', the remainder are defined as unsuccessful. In so far as those successful at age five remain successful until the statutory leaving age, it means that a majority of children are treated as relative failures for ten or so years. These children are heavily over represented in the working class, particularly the lower working class. Somehow our society lacks the wit or the humanity to ask itself what it is like for a child to be required to enter a situation day after day, year after year, where he is defined as incompetent. That such children are only bored is a testimony to the human being's capacity to endure.

While data to give real strength to this sad view that LWC children are general victims of punitive schedules of reinforcement both at home and at school still have to be collected, a prima facie case for such a contention is easy to draw up.

The general fate of MC children is not, however, wholly enviable. Both home and school may be operating reward rather than punishment schedules, but the price of continuing rewards is continuing success - and punishment is available if needed. Evidence on the development of the high achievement motive in children associates this with heavy rewarding and punishing by mothers. Mothers of boys with high achievement motive in fact punished them more for failure than did mothers of low boys, but this took place in a much more rewarding context (Rosen and D'Andrade, 1959). The caricature of the influential mother that can be extracted from Berkowitz (1963) is of an emotional dynamo, switching 'love' on and off strictly in relation to whether her child meets the standards she sets for it. Her friends would represent her as utterly devoted to her children's success; her enemies would call her a vicious domineering blackmailer.

The MC child can console himself that the reinforcement schedules do enable him to acquire large quantities of information in the course of his educational career. If he is fortunate, he will also be given the opportunity to process this information, analyse and organize it. If he is very fortunate, he will not be so sick of response-based learning that his intrinsic motivation for knowledge acquisition will have atrophied. Casual observation of the elite at university does not serve to reassure; there appears to be more similarity between Skinner's pigeons pecking for food and students learning right answers for degrees than popular myth would have us believe. Their KAD's have not been destroyed, but they have not been systematically developed either. They are apt to complain, and with justification, that there is no time to use their KAD's except for vacuum cleaning writings from set books and lectures.

This brief evaluation of reinforcement schedules in learning is intentionally contentious. It is not being suggested that attempts should be made to eliminate response-based learning from home and school. It is being suggested that we should be aware of the consequences of using the rewards and punishments we do and that these consequences be carefully examined and evaluated, especially in so far as they may result in a stunting of the development of an independent general problem-solver.

Limitations of the Analysis of Maternal Behaviour.

We have arbitrarily divided the role of mother into four aspects, each of potential relevance to the intellectual development of her child. They are by no means exclusive or exhaustive.

With the category of Informer we emphasize her role as a passive source of verbally mediated experientially based knowledge. With that of Teacher we emphasise that she is an active source. With that of Prescriber we emphasize her role as a definer of what is proper and appropriate rather than what is true or false. With the category of Rewarder and Punisher we note her power as a controller of behaviour rather than as a provider of knowledge. But any particular situation may well compound all four.

We have omitted to discuss the extent to which her provision or withholding of objects may be relevant to d development. By buying some toys rather than others, she affects the chances of some skills rather than others developing. By her arrangement of the furniture, she affects the chances of accidents and conflicts occurring.

By her watchfulness and her insight she can affect whether 'punishments' are administered before, during or after events. By encouraging some friendships and discouraging others, she can affect the learning opportunities of her child.

We have totally ignored affective development and the necessary integration of intellect and affect in growth.

Summary.

The evidence brought forward and the mini-theories reported combine to substantiate the theoretical framework outlined in these two chapters. It is fruitful to assume the basic validity of a cognitive developmental approach to intellectual development and ask how factors outside child may interfere with this growth. We have not cited in any detail the extensive studies of the effects of reinforcement on behaviour. Such evidence as we have mentioned is consistent with the view that what currently happens in homes, schools and society generally frequently involves a heavy reliance on motivation supported by external incentives. We do reward what is defined as good and we punish what is defined as bad. To the extent to which we do so, we risk diminishing the power and value of intrinsically motivated learning. It has been argued that this can effect the acquisition of both first-order and second-order knowledge and that it may depress the vigour of the operation of KAD.

We have suggested that the dominant modes of incentives may differ for LWC and MC children. We have raised the suggestion that MC children are exposed to predominantly reward-based schedules of reinforcement both at home and at school, but that the threat of punishment for failure hangs ready in the background. Persistent general failure at school for inadequate academic performance and punishments at home as a means of establishing proper behaviour emerge as more likely experiences of the LWC child.

The relevance of the structuring of the environment to the development in children of knowledge, knowledge acquisition skills and the frequency of their utilisation is more highly associated with empirical evidence. We are able to specify conditions associated with high rates of questioning, complexity of questioning, and high amounts of verbally expressed knowledge by children. Not only can we show that maternal behaviours are relevant, we can understand why they should be. There are social class differences in the behaviour of both mothers and children consistent with the ideas of Piaget's view of cognitive development and Bernstein's views about the differential use of language.

WHAT IS TO BE DONE.

We have to find out more about the intellectual development of children. We hope that the story told in these chapters may prove to be a more constructive framework for posing problems than more starkly partisan alternatives. But having made due obeisance to the gods of more research, we may also note how little society does to transmit the fruits of research back to those whose roles require them to possess such knowledge. A cynic might add that what we do manage is usually expressed as an insulting criticism to some sector of the population and a demand for more governmental intervention!

It is perhaps surprising and distressing that human beings are so uninterested in themselves. Our lives seem to have become arranged so that we have neither the time nor the interest to find out more about ourselves. More particularly we are surprised that people are so uninterested in child development. Parents have such prolonged opportunities to observe their children, it is extraordinary that more is not generally known.

We in the specialised institutions do our research and write research reports that may be misreported by the mass media, while the mothers, fathers and teachers who ultimately pay for the research are left ignorant of the fruits of their taxes. In one sense it is their own fault. There are limits to what we can do. If they choose not to read the paperback books we write, we neither can nor would try to make them.

On the other hand government, both central and local, could promote an interest in knowledge rather than complain of the expense of providing resources to 'compensate' for the inadequacy of home backgrounds. The preferred solution to problems is more frequently in terms of means that deprive parents of responsibility rather than equip them to shoulder and enjoy the responsibility. There is virtually no encouragement given to parents to teach their children; there is evidence rather of the reverse, particularly in working class areas. One strong class difference between mothers in Bernstein's sample was the perceived division of responsibility for promoting the development of the child. MC mothers saw the child as a unit and thought teachers and parents should cooperate to help the child; WC mothers were more likely to say discipline and nurturance were their problems and education the teachers' (Jones, 1966)

Perhaps the nursery schools envisaged would be more successful if mothers came to see what can be and needs to be taught to children. Perhaps courses in child development might boost morale and the thirst for knowledge in many a classroom in secondary schools. Perhaps we could try to destroy the pernicious stereotype that defines an active interest in his children's intellectual development as an unmanly concern for a father.

Our society has so far been hopelessly unimaginative and unenterprising in its approach to helping parents to help their children.

We confined our attention to teachers. We concentrated on teachers concerned with mainly working class children because if one passes a social class-related judgement, these children lose out more - their knowledge and KAD's are more likely to be less developed than possible, their verbal skills in questioning and answering an obvious target for improvement. But first we need to know more about the development of questioning skills, the processes and problems. And we also need to be convinced that LWC children have special difficulties before suggesting any special teaching efforts directed towards them.

CHAPTER 3.

QUESTIONING, ANSWERING AND SOCIAL CLASS

ABOUT QUESTIONS AND ANSWERS

Growth In the Mastery of Interrogative Forms.

Two recent accounts of the questioning behaviour of children are more remarkable for their differences than similarities. Cazden (1972) writes clearly and simply about the growing child's attainment of mastery over the production of the various interrogative forms of the English language. She selects and summarizes the case studies recorded by Brown's group at Harvard. The description is in the terminology of transformational-generative grammar. Robinson and Rackstraw (1972, pp.2-6) and chapters 2 and 3) fill many more pages with a taxonomic schema for the classification of questions, answers, and the relationships between the two. This account takes its terminology from descriptive linguistics, mainly from Halliday (see Turner and Mohan, 1972). While it lists the conventions of adult English usage and locates and defines possible sources of choice, error and confusion at grammatical, lexical and semantic levels of analysis, Cazden concentrates on stages of growth and attempts to extract the 'rules' that might be used by children to generate the various intermediate interrogative structures they produce.

The reasons for these differences are easy to understand. One records the growth of the picture, the other is intended to present an idealised finished portrait.

Together they provide the history and the geography. History is perhaps the better starting point, but itself needs to be prefaced by a brief synopsis of how the transformational tradition construes the problem.

Interrogative forms are treated as derivatives from an implicit declarative base structure. The transformations are achieved by a number of separable operations. We have to move from the declarative 'The boy can drive a car' with its posited structure of (Noun, Phrase, Auxiliary, Verb Phrase) to the interrogative 'Can the boy drive a car?'. This is achieved by preposing the auxiliary. If no auxiliary had been present, it would have been necessary to prepose the appropriate exponent of the verb 'do'. Interrogative structures introduced by the special interrogative 'wh' words (what, which, who, where, when, why, how and their elaborations) are treated as derivatives of declaratives like 'He is going somewhere'. To arrive at 'Where is he going?' two operations are necessary. Preposing with a deletion of 'some' yields 'Where he is going?', but a transposition or inversion of 'he' and 'is' is also required to produce the final form. Tag interrogatives like 'John does understand, doesn't he?' are described as needing pronominalization (he), negation (does not), interrogation (does he not) and truncation (doesn't he?) of the initial statement. When interrogatives introduced indirectly by verbs expressing uncertainty such as 'I wonder where....', the inversion rule does not have to be applied.

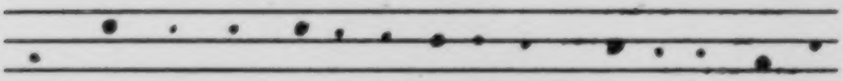
Doubts might arise about a number of features of this type of analysis. Certainly there are rules to be learned. The assumption that they have to involve changes from a declarative base may be desirable in linguistics but unnecessary in psychology, especially if interrogatives are found to occur as early as declaratives in the repertoire of the first verbal endeavours of children.

One aspect played down in what is mainly a syntactic story is the relevance of prosody. 'Prosody' is the linguistic term used to embrace the whole range of the melodic aspects of speech rate, pitch, loudness, duration, hesitations etc. Sometimes one suspects that transformational grammarians ignore prosodic features because the written transcripts they work with omit them - and what is not seen is then forgotten. European linguists have not fallen into this trap (e.g. Crystal, 1969; Uhlenbeck, 1972). They have argued for the necessity of including melodic features in any comprehensive analysis of speech. In his classic text on phonetics, Jones (1956) described the basic tunes of English sentences and labelled the typical interrogative intonation pattern 'Tune 2' (see Fig.2) He had noted that declarative as well as interrogative forms could be uttered with a sustained use of pitch at their ends and that these served as questions and not statements, 'You see what I mean?' Perhaps because of her concern with syntax, Cazden's account omits the development of this form of question. It may be for similar reasons that she does not mention that imperative forms such as 'Tell me why you forgot!' can function as perfectly polite questions - if uttered appropriately. She does cite the work by Menyuk and Bernholtz (1969) on one-word utterances of one very young child which illustrates the significance of prosody. They examined a number of instances of utterances of the same single word spectographically. They report three distinguishable pitch and duration patterns. Each pattern was treated as having a beginning, middle and end. The pitch of the longest type rose in the middle and fell away sharply at the end. The second longest type shared the same pattern but had a weaker rise in the middle and the sequence was pitched lower throughout. The shortest showed a rise in the middle intermediate between the other two, and this pitch was maintained through to the end. The three types were identified as commands, statements and questions. The suggestion is that, with appropriate prosody, 'door' could be used to indicate, for example, 'Shut the door!', 'There is a door', 'Is that a door?'. Alas, as with too many linguistic analyses, these diagnoses were not validated against the context of the utterances and how they were in fact used and interpreted, but against the ability of three linguists to sort them successfully into

TUNES OF QUESTIONS

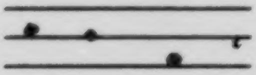
Questions using Tune 2

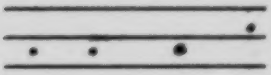
Questions requiring the answer 'yes' or 'no':



bət 'wɔz hi: ði 'ounli in'telidʒənt 'mænin ðə 'kʌntri?

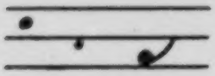
But was he the only intelligent man in the country?

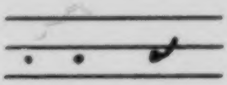




'did ju: 'laik it? or did ju: 'laik it?

Did you like it



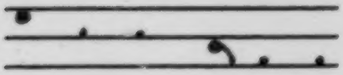


'iz hi: 'gɔn? or iz hi: 'gɔn?

Is he gone?

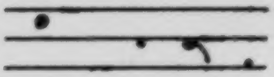
Questions using Tune 1.

(2) Questions containing a special interrogative word:



'hu: wə ju: 'tɔ:kiŋ tu?

Who were you talking to?



'wɔt s ðə 'mætə

What's the matter

Fig. 2.

three piles! Miller and Ervin-Tripp (1973) mention that one of their intensely studied infants was apparently using maintained pitch to discriminate between questions and statements at the age of one and three quarters, although it was not until she was over two that rising intonation was consistently used to mark questions. Adults had treated the 'questions' as questions and 'it may be that she learned the intonation by noting which sentences drew a response from an adult' (p.374).

If such work could be repeated, extended and validated it might encourage the consideration of at least three points; the significance of prosodic features in early, and later, speech development, the importance of the responses of adults to children's speech, and thirdly the abandonment of the idea of declarative structures having some fundamental significance in the development of speaking and listening skills.

In the meantime we must be content with the story of the development of the syntactic aspects of interrogative utterances as revealed in the extensive and intensive case studies pursued by Brown's Harvard group. Table 1 charts Adam's progress in the production of interrogatives.

Cazden warns of the dangers of attempts to over-generalize from the results obtained. There were differences in the durations for which intermediate forms were retained in each sample child's speech. Each of the three children studied constructed temporary idiosyncratic forms - it appeared that these set formulae could either disappear abruptly after intensive use or serve as a foundation for a next development. The order in which later forms appeared was not constant from child to child.

This element of disorderliness is now recognized to be a more likely feature than the universal sequence beloved by and believed in at one time (see McNeill, 1970 for the belief and Bloom, 1970 for the disorderliness).

TABLE 1.

STAGES IN THE DEVELOPMENT OF QUESTION FORMS.

Ages for Adam	Yes-No Questions	Wh-Questions
Period A (28 MOS.)	Expressed by intonation only: Sit chair? Ball go?	Limited number of routines: What ('s) that? Where NP go? What NP doing?
	More complex sentences being questioned, but no development of question forms themselves except the appearance, probably as routines, of two negative auxiliaries don't and can't.	
	Dat black too?	What soldier marching?
	Mom pinch finger?	Where my mitten?
	You can't fix it?	Why you waking me up?
Period C (38 MOS.)	Development of auxiliary verbs in the child's entire grammatical system. Inversion of AUX and subject NP in yes-no questions, but not in Wh-questions.	
	Are you going to make it with me?	What I did yesterday?
	Will you help me?	Which way they should go?
	Does the kitty stand up?	Why the Christmas tree going?
	Can I have a piece of paper?	How he can be a doctor?
Period C-F (42-54 MOS.)	Development of tag questions from Huh? to mature form:	Inversion of AUX and subject NP, first in affirmative questions only:
Period D + E	I have two turn, huh? We're playing, huh?	Why are you thirsty? Why we can't find the right one?
Period F	That's funny, isn't it? He was scared, wasn't he? Mommy, when we saw those girls, they were running weren't they?	Later, starting in Period F, in negative question also: Why can't they put on their diving suits and swim? Development of complex sentences, including indirect Wh-questions: You don't Know where you're going. He doesn't know what to do. We don't know who that is.

Extracted from Cazden (1972).

It does seem to be true, however, that children take one step at a time. A new feature is taken into the repertoire. Its initial use is not perfectly appropriate, but is widened, narrowed and redeployed until it stabilizes. The most likely source of information for improvement in accuracy in the use of features is the responding of other people. Is the child's utterance corrected or ignored? Is it responded to in a way that confirms or corrects the use made of it? One might expect that the particular steps taken will be a joint function of 'easiness' in terms of present knowledge, pressure of demands of self and others, and opportunities for learning through testing.

The stumbling incremental approach can be illustrated with Cazden's citations that transposition entered into Yes/No interrogative structures before it entered into those introduced by 'wh' words, and by Bellugi's isolated demonstration that transposition in a 'wh' question was lost when the child was encouraged to incorporate a negation into the question as well.

Generally, the results testify to the value of a transformational-generative approach for structural analyses, just as do those that focused on the development of pivot-open classes, negations and passives (Brown, Cazden and Bellugi, 1968; Brown and Hanlon, 1970).

However, the child's activities with language are not unlike his other efforts at organizing himself in relation to the world and may yet be subsumed as a special case within Piaget's theory of development. Children are active. They imitate, but they also invent 'rules' and try them out. Their development is messy, but not chaotic. They build cumulatively, incrementally, and uncertainly on their current knowledge. In the case of questioning, adults respond or do not respond to their questions; they correct and they ask questions of the child and require responses. Perhaps one reason why children do not make faster progress with questioning is that adults are relatively unhelpful to them.

Brown and Hanlon (1970, p.44) present a table showing that under half of the three children's 'wh' questions evoked replies that could be labelled as 'sequiturs.'

In spite of such hazards, Brown's children were producing all the basic syntactic varieties of question forms and all the 'wh' words by the age of four and a half (Brown, 1968). Their beginnings with 'Sit chair?' and the repetitive 'What dat?' had proceeded through 'who', 'where,' 'why', to 'how' and a hint of 'when.'

The plausibility of the proposed psychological complement to the linguistic story is enhanced by Brown's illustration of the entry of 'why' into Adam's repertoire. The first fifteen recording sessions yielded five instances of 'why', the next three fifty four. This fanatical rate is maintained over a number of sessions and then falls away rather rapidly.

Initially most 'why's' arose directly from the mother's speech, but subsequently an increasing proportion seemed to arise from his own actions and thoughts. Why the increase in usage and then the decline? Why is the mother's speech initially used as a springboard? More information than Brown makes available would be necessary to allow interpretation with conviction. We are not told how accuracy of usage changes during the period, although the examples given show that meaningless questions did occur.

We might guess that at the time the ability to utter the noise 'why' was acquired, Adam had some understanding that this was a question word and an inchoate notion that its meaning was different from 'what', 'who', or 'where'. Heavy use directed at mother's speech should maximize the chances of finding out the meaning of 'why', if her responses provide knowledge of results. Whether such a strategy were conscious or not, it would be an obvious way to attempt to establish the underlying concept. Does the end of the period of heavy use coincide with a sufficient grasp of the concept of 'why' for the word to be used with a high degree of appropriateness in questions? If so, then the subsequent lower rate would reflect the child using the word to find out answers to questions, but the earlier higher rate was to find out what the word itself meant. Is there not a similarity to the infant's mastery of fitting shapes into holes or his thumb into his mouth?

That the basic interrogative markers and structures can be mastered by four and a half is confirmed by the studies made by Ervin-Tripp (1970) of a substantially larger sample of children, twenty four in all. (but see p.79 for a qualification) Brown's data were spontaneous productions in the home. Ervin-Tripp's record of naturally occurring questions was supplemented with deliberate attempts to elicit questions from the children by having them ask someone something. She found that comprehension measured as a capacity to respond with semantically appropriate answers preceded production by several months. She noted that Carol made replies to 'who' questions which would have been more appropriate to 'what' and 'where'. Laura gave location answers to 'what do' questions. These are mentioned to insinuate once more that the development is not the clean and neat unfolding of a preprogrammed intellectual giant. Like Cazden, Ervin Tripp mentioned complications and departures from norms, but emerges with a satisfactory similar order of mastery over the 'wh' words: 'what(is)", 'where', 'what(do)', 'whose', 'who', 'where from', 'How' and 'when'.

While there are interesting differences between the approaches of Ervin-Tripp and Brown that cannot be discussed here, it is reassuring to find the considerable similarity in their results. If we are tempted to be disparaging about the roughness of either the data or the conclusions, we should do well to remind ourselves that these were pioneering efforts into new areas with untried analytic tools. It may also be that refinement of methods of observation and testing will not lead to the uncovering of different information about sequence in development. If categories of description are made sufficiently abstract, then some universality would be expected, but the more detailed and particular the descriptions are the more likely there is to be variation from child to child. Questioning is only one aspect of language. Learning to master language is only one aspect of cognitive growth. Cognition is not the only system that is developing. This not only makes it more difficult to tease out changes in any particular features and to find out why they occur, it also opens up greater possibilities for variation in the order of mastery - provided that these do not presume accumulative growth. We may well expect that environments which make available equally difficult independent problems in different orders will lead to different orders of learning in children. We shall need to look at learning opportunities more closely. However, we may well think of good reasons why intonationally based one-word questions should come before 'wh' questions, why the temporal 'when' is so much later than the spatial 'where', why preposing precedes transposing. At present, in the absence of explanations for the ordering found, we have no justification for assuming cross-cultural universality. But language development is a growth area (see Ferguson and Slobin, 1973), and subsequent studies should be able to build on the framework now available for pinning down both the what and how of the development of questioning.

If our main interests are in children at school, in what their problems are and what we might reasonably expect them either to know or to be capable of learning quickly about questioning and answering, then the behaviour of the children so far reported suggests that the starkest elemental aspect of the questioning game has been solved round about the age of two. By this age the child is using some utterances to elicit specific types of verbally represented knowledge from other people, and he is responding differentially and verbally to questions posed to him.

We should therefore expect children of five to have mastered the fundamentals of questioning and answering! We can further expect that the majority of children entering Infant School should be able to use and understand the whole range of interrogative words and structures. Those who cannot are most likely not to have yet learned how to handle 'when' and 'how'.

This generalisation is unfortunately too superficial. We must look beyond identity on the surface to difference in the depth; the 'what' of 'what dat?' does not have the same meaning as the 'what' of 'what is a dog?' Our own coding discriminates between the 'what' of identification and the 'what' of definition, but we would not pretend that we have exhausted the meanings of 'wh' words in the referential categories we have used (see Robinson and Rackstraw, 1972, chap.2) Similarly, within a band of meaning, the sort of causal answer to a 'why' question that would be acceptable to a five year old might not satisfy the examiners of a doctoral thesis. Hence, to assume that five year olds know all they need to know about interrogative words would be wrong. They may have all the necessary lexical units in their vocabulary and have some acceptable meanings associated with them , but the full conceptual range of those units will be beyond their current grasp. That apart it remains true that unless the children studied so far have been abnormally well-endowed intellectually and exceptionally blessed with proficient teachers, their peers entering Infant Schools should generally be able to pose all forms of open and closed questions properly. If they cannot, there appears to be no good reason why an immediate effort should not be made to teach them how to do so.

But what is it they will require to be taught? So far we have concentrated on the development of mastery over the various syntactic structures, with a passing reference to the role of intonation. We have seen that some general assertions can be made about the sequence of development of forms, and we have offered some interpretations about the manner in which the meanings of the various forms are mastered. We have still to become acquainted with the taxonomy of questions and answers, but perhaps we ought first to consider just what we mean by 'a question.'

The Definition of a Question.

Brown and his co-workers and Miller and Ervin-Tripp presuppose that we adults share a sufficient understanding of what a 'question' is for its definition to be unnecessary. Most people looking at the questions studied would agree ~~that the~~ utterances examined were indeed questions, but others might wonder whether some were in fact commands - requests for action. Does it in fact matter how we define 'question'?

We can remind ourselves that definitions are not true or false; they are recommendations. They are useful because they help to prevent unnecessary misunderstanding. They help to emphasise similarities and differences. Our previously published specification of the prerequisites of questioning cited two such: a gap in a framework of knowledge or belief and the availability of alternatives to fill that gap. These were elaborated (Robinson and Rackstraw, 1972, pp.16-17):

> 'Regardless of whether the answer is already known to the questioner or not, the possibility of questioning requires that he has a framework of knowledge and belief and either has a gap in this or can conceive of one.
>
> The second prerequisite of questioning is that of holding a set of possible ideas as answers, not all of which empirically are, or even logically could be, true. A question is posed signifying a gap which may be filled by one or more from a set of possible entries. If the questioning person could not conceive of the possibility of an entry different from that presently given, there could not be a question.

> This is not to say that the alternative can be specified, but only that any present entry is capable of being denied.'

The reader might have been left in less uncertainty about the nature of questions if we had omitted to read these conditions, they look a little as though a lawyer has had a hand in their drafting. Unfortunately, nothing simpler could be devized.

Many children's (and adults')'Questions' will not meet these criteria. One critical word is 'true' in the second prerequisite. Many of the earliest 'questions' of children are requests for action, dietary and other demands figuring prominently in early speech. These requests are either met or not, the implicit commands are obeyed or not obeyed. The answers are not to be evaluated as true or false, except in a devious and perhaps unhelpful way. The virtue of the distinction lies in the difference between function and form. We need to separate the functions of stating, questioning, and commanding from their 'primitive' linguistic realizations in declarative, interrogative and imperative forms. If we assume one-to-one correspondence, we shall not be able to explain how forms and functions come to acquire the loose linkage between the two which speakers eventually manage to master. The appropriate response to a command is an action. 'Would you pass the bread, please?' is not functioning effectively if it evokes only the reply 'Yes'. Hence, the mysterious heading to the first section with its apparently pedantic references to 'interrogative form' rather than 'question'. In that section we were only prepared to use 'question' when the interrogative forms were serving that function.

We wish to maintain this distinction partly because the child's earliest 'questions' and those addressed to him, particularly those treated as Yes/No questions are often action oriented. They are requests for goods and services;

attempts to control and not attempts to gain knowledge. Unfortunately, because analyses conducted so far have concentrated on the development of mastery over formal linguistic features, they have excluded this functional distinction. Additionally, Weir (1962) has remarked, and the data referred to above suggest, children are also using questions with metalinguistic consequences. They are finding out how to ask questions which 'wh'words mean what,although they may not be aware that this is what they are doing.

Whether or not verbal questioning in our more restricted sense begins simultaneously with the use of interrogative forms for controlling the behaviour of others or whether it grows out of it, we do not know. It would be worth finding out. In the meantime we think the distinction between surface form and meaning is worth maintaining. We would prefer that studies that are simply looking at 'interrogative forms' should use that phrase to refer to the objects of their attention. That said, it is true that the 'wh' words studied have occurred in utterances that meet our criteria.

Do we wish to allow non-verbal implicit questions to exist? Is the rat at a choice point posing himself an implicit question? Our representation of question types according to form does allow this, but anyone attributing such questions to rats or monkeys might feel obliged to talk about implicit rather than 'explicit' questions, and in context, misunderstanding is not likely to develop.

To provide a framework for subsequent studies we can proceed from process to content and let our definition stand.

Types of Questions.

It has already been suggested that questions fall into two broad, contrasting types:

Type 1. 'Open' knowledge seeking. This type of question most clearly exemplifies the first prerequisite, since it functions to discover information relevant to filling gaps in a framework of knowledge. One linguistic expression of such a question is 'What is X?'. An assumption is made that 'X' is something characterizable by the relative pronoun 'what', i.e. an object, substance, position, or process which can be referred to by a substantive. The demand is for a specification of its nature.

Of course, the presumed truth-value of the information already given in the question can be rejected, e.g. 'Who took that?' 'Nobody'. It could be argued that the assumption of the question being invalid should have been anticipated by a prior investigatory type 2 question, e.g. 'Did anybody take that?'

Type 2. 'Closed', confirmation/denial-seeking. The second prerequisite involves the conception of a set of statements at least one of which may be false. This type of question demands that a truth value be assigned to a statement. A closed set binary decision is required, as opposed to the more open set of choices offered by a Type 1 question. If the question consists of a series of statements or offers more than one alternative, a succession of binary decisions may be required. The linguistic expression of such a question might take the form: 'Is X Y?' Once the existence or meaningfulness of 'X' is presumed, then the predication of it as 'Y' may be either confirmed or denied.

These two types of questioning do not imply different subject-matters of interest. It could be argued that they are polar extremes along a dimension of minimal to maximal constraint. Questions like 'You would agree that the blue one is prettier, wouldn't you?' appear to offer a somewhat biased binary choice, while husbands advising their wives when out shopping might not feel that they are being given any discretion in the form and content of their reply. At the other extreme, 'why' questions allow a very wide range of choice. Perhaps each type should also be viewed as reducible to the other. The confirmation/denial question type can be made redundant by reducing the prior assumptions of the question, e.g. 'Who took the book? might obtain the same information as 'Did X take the book?'; hence the open version could serve an equivalent function. Similarly, the knowledge-seeking Type 1 question could be rendered redundant if all alternative possible answers and their potential truth values could be conveniently specified and converted to binary decisions. If all possible answers to 'What is X?' were listed, a succession of 'Is X Y?' questions, where 'Y' takes all possible values, should lead to an eventual solution.

The choice of form will be multiply determined, but, all else being equal, the probability of obtaining a quick, useful closure of the knowledge gap is greater, it would seem, the nearer to the open end of the dimension the question can be formulated. Closed questions yield high information if they are answered to support the suggestion they contain, but almost no information if they fail to gain such support. Conventionally, respondents will often follow a denial of the questioner's hypothesis with the 'right' answer.

It might also be argued that there is an intermediate level of constraint which offers a multiple choice from a defined set of possibilities. Such alternatives may be exclusive, but not through being empirically or logically opposite. The assumption is that at least one will be given a truth-value different from the others, e.g. 'Did you walk to work this morning or did you come by bus?' These can be generalized, 'How did you come to work this morning?' or reduced to a succession of binary decisions, 'Did you walk to work this morning?'

It may seem odd to elect for a typology when a continuous dimension can be conceived and perhaps realized. Our decision to do so can make an appeal to what people actually do; 'wh' questions are frequently not reduced to a finite set of binary choices and confirmation/denial questions are not necessarily posed in a more general manner. For empirical purposes, it is therefore a reasonable decision to use the two types rather than the continuum; a variable from which two values take up most of the cases may be better treated as discontinuous, at least for the purposes of social science.

The linguistic forms of questions.

The two types of question have each what might be called their normal form of linguistic expression in interrogative clauses. Under some circumstances, it might be sensible to include expressions representing features central to the concept of question, viz. to obtain information or to confirm or deny, but which are not expressed in the interrogative form, e.g. 'Let's see how X works', 'Tell me whether X is true'. These imperative demands can be construed as demands for answers to questions whose interrogative forms are readily made overt: 'Let's see the answer to the question, 'How do you work X?' and 'Tell me the answer to the question, 'Is X true?'.

Certain declarative forms of statements can also function as questions, e.g. 'I should like to know the meaning of this'. 'I wonder if it has any meaning'. These examples manifest the two prerequisites of questioning cited above. They are normally labelled 'indirect questions.' Independent of context, however, they may be better treated as statements of which the major theme is the speakers uncertainty.

The normal forms of the two types have both similarities and differences.

Similarities and Differences in Form for Open and Closed Questions.

Type 1: Open, knowledge-seeking	Type 2: Closed, confirmation/denial seeking.
At least clause rank.	At least clause rank.
Where the interrogative group is not of the class 'nominal', predicator precedes subject. 'Wh' interrogative marker [illegible] word or group rank.	Either predicator precedes subject. Or Rising intonation at the end of the utterance (Jones, 1956, Tune 2). see (Fig.2)
In the unmarked form the interrogative marker is the first work in the clause.	When predicator precedes subject the verb or the auxiliary 'do' is the first word in the clause.
If the substance is phonic (oral questions), there is a normal intonation pattern (Jones 1956, Tune 1.) If the substance is graphic (written questions), '?' is used at the end.	If the substance is phonic, there is a normal intonation pattern (Jones, 1956, Tune 2, for unmodified, and tune 2 + 1 for disjunctives). If the substance is graphic '?' is used at the end.

Types of Open Questions.

Open questions may be divided into types on the basis of the different interrogative markers used, and we may differentiate between 'who', 'which', 'where,' 'when', 'what', 'how', and 'why' questions. This division of open questions enables a specification of the particular linguistic constraints that a given question type exercises on potential answers.

'How' questions are more complicated than others in that they appear to divide into four distinct types or 'modes' which have linguistic markers in their associated answers. Mode 1 of 'how' is concerned with state or adjectival description and is marked by an ascriptive verb demanding an intensive complement, e.g. 'How are you?', 'How long is the wall?'. Mode 2 expresses manner and demands an adverbial group, e.g. 'How did it go?, 'How well do you ski?' Mode 3 asks for a specification of a process or method which may be supplied by a series of free clauses or by an adverbial group introduced by an agentive marker like 'by' or 'with', e.g. 'How do you ride a bicycle?' Mode 4 is the theme predicated type which asks for an explanation that may take many forms e.g. 'How is it that John always gets here first?'

Referential categories for open questions.

It may be possible to regard the different subcategories of questions defined by their interrogative words or groups as normally representing referential categories within which information may be sought. A small set of interrogatives appears to have a specifying function within the referential categories normally represented by other words or groups.

We have sought to reduce the number of referential categories to a minimum by making each as inclusive as possible. The list which emerges is as follows:

Category	Subcategories	Normal interrogative groups.
1. Identification	(a) Personal object	Who
	(b) Impersonal object	What
	(c) Action	What (+ doing, happening, et.)
2. Definition		What (+ is/are)
3. Description (non-state)		What like, What about
4. Placing	(a) Time	When
	(b) Space	Where
5. Explanation	(a) Categorization	Why
	(b) Effect	Why
	(c) Cause	Why, How (4)
6. Process		How (3)
7. Degree		How (1), how (2) (+ relevant dimension)
8. State		How (1)
9. Kind		Which (+ noun)
10. Manner		How (2)

The interrogative markers which serve to specify and classify are 'what' and 'which'. They can act within the other categories to specify the sort of answer required, 'At what time did he come?' This asks for the same sort of answer as that required by a 'when' time-placing question prescribing the mode of answer. There are also instances of groups operating within other groups, e.g. 'How long ago was the war?' Time-placing is the background category, degree the surface concern. This specifies the mode of answer (for a 'when' question), just as the former example does.

Closed confirmation/denial questions can operate within any of the groups, e.g. (Identification) 'Is this a knife?' (Explanation) 'Did you do it for my sake?'.

For completeness this classification will need a further functional underpinning. We have already referred to three general functions of utterances: stating, commanding and questioning. We have noted the structural features of questioning and argued that it serves to fill gaps in knowledge. But we have also pointed out that there is dissociation between form and function. One source of dissociation has stemmed from the failure to incorporate the prosodic features (or in writing '?') into the linguistic analysis. When this is done we can distinguish questions from statements and commands. At the next level of decision where we have to identify whether or not 'questions' are serving primarily to fill gaps in knowledge, we run into difficulties.

Functions of Questions.

With that slightly insincere claim to tentativeness that academics use to disclaim their efforts, one of us produced a table listing fourteen functions of language (Robinson, 1972 pp.50,51). Examples of the fourteen are listed originally for declarative rather than for interrogative forms - except for the Inquiry Function 13, that is.

This table is reproduced to show how interrogative forms could fit into that scheme (see Table 2).

The original accompanying text pursued a number of problems raised by the list, - its arbitrariness, its need for expansion or contraction in the context of particular investigations, its failure to hold levels constant, e.g. one may conform to a norm in order to control someone's behaviour and one may control someone's behaviour in order to conform to a norm! On the positive side, the text drew distinctions between purposes and functions, pointed out that utterances can be, and often are, multi-functional, and offered suggestions for means of identifying functions, while recognizing that observation of behaviour alone may not be able to provide this information.

Here, the object of providing the list is to illustrate that interrogative forms can serve many functions. It is important to distinguish between appearance and reality. A question from the back of a classroom first thing on a Monday morning does not necessarily announce a new era of curiosity unbound; it may be just another prelude to a lark. Hopefully, the list will at least serve as a checking framework for diagnosing the intention of 'questions', even if it is less than perfectly helpful as a means of identifying functions.

As we have seen, children may be using questions to find out how to ask questions properly (Function 14), but of course they may remember the answers as well and in leading to this acquisition of knowledge per accidens, such questions may be serving function 11 as well.

But which of the fourteen should be labelled as 'questions' proper. We might perhaps separate out attempts to control the states and behaviour of self and others (2b, 6 and 7) as 'requests' rather than questions, but we

TABLE 2.

FUNCTIONS OF SPEECH ACHIEVED WITH INTERROGATIVE FORMS.

Function.	'Obvious' examples.
1. Escape from or avoidance of discomfort.	Why don't we talk about your problems?
2. Conformity to Norms	
(a) Institutionalized (see book of rules)	How do you plead?
(b) Subinstitutional (conventions of politeness)	Would you pass the salt?
3. Aesthetic	Or art thou but a wandering voice?
4. Encounter regulation	
(a) Opening interaction	How are you?
(b) Role switching (speaker/listener)	What do you think?
5. Performatives (promising etc.)	-
6. Regulation of self	
(a) behaviour	Where are my glasses?
(b) affect	Why am I such a misery?
7. Regulation of others	
(a) behaviour	Would you pass the salt?
(b) affect	Why don't you cheer up?
8. Expression of affect	
9. Marking of emitter	-
(a) Emotional state (anger)	
(b) Personality (shy)	
(c) Identity (British)	
10. Marking of role relationship	Now where is the pain?
11. Filling gap in knowledge	Any, provided answer can be evaluated as true or false.
Instruction:	
12. Checking knowledge of other	What is an acid?
13. Inquiry	
14. Metalinguistic: finding out about language	What does 'how' mean?

shall find what appear to be attempts to fill gaps in knowledge also serving to attract and maintain attention as well as to control the behaviour of others. Young children sometimes like to hold conversations with adults. They can be somewhat short of the opinions and knowledge necessary to maintain a balanced interaction, but they can ask questions. It is an excellent strategy, requiring minimal knowledge and effort. Sensible, irritating children can exploit this.

Rather than delve into the problems of whether rhetorical questions and teachers' probing are best labelled 'questions' or not, we shall hope that no misunderstandings will occur if we use 'question' both in its everyday senses and, more frequently, in our narrower gap-filling capacity.

Neither will we elaborate the reverse side of questioning, that is no questioning. There are norms regulating where, when and of whom questions may not be asked. It is alleged that well-bred subjects do not ask questions of the Queen. Questions are not often directed at preachers in pulpits, lecturers in formal settings, or school teachers in classrooms. Patients and interviewees are not expected to ask as many questions as they expect to receive. Little children..., Certainly, the stereotype of the norm for earlier points in our history evaluated children asking questions of adults as impolite and impertinent, and the children would be told this in situ. This still happens. Children are told that it is rude to ask people questions, but now frequently, by whom, where and when we do not know. For present purposes we do not need to know.

Answering Questions.

To have separated questions from answers as we have done could be misleading. Answers can be defined only in relation to questions. The concept 'answer' is rational not categorical. To write about mastery of interrogative forms is to presuppose a mastery of the question-answer relationship. We use questions to find out answers. We begin with a problem, and posing questions is one means of attempting to solve it. We can only pose the most efficient and appropriate if we know the type of answer we require.

However, the actual learning of questioning skills and of the roles of the various interrogative devices has, initially, to take place without having a clear knowledge of what the devices do. It is only by seeing the answers he receives and the rejections of questions as nonsense that a child can learn the rules of the question-answer exchange. It may be advisable to remember this when examining the behaviour of children rather than adults.

In our earlier work we constructed criteria for separating answers from non-answers.

Behaviourally, an answer must

(1) follow in time an interrogatively posed question;

(2) be given by a person who has received the question;

(3) be expressed in language.

Formally, an answer must

(1) consist of at least one declarative clause;

(2) have lexical continuity with the question.

Contextually, an answer must

(1) convey a statement,

(2) not consist of a refusal to answer,

and (probably)

(3) be able to function within the same referential category as the question.

Where responses did not meet these specifications, they could be classified as irrelevances of various kinds, statements of ignorance, refusals, or failures to observe that a question had been asked. Once a response could be classified as an answer, we then described it in terms of appropriateness, completeness and what it presupposed under each of three headings: context, mode and form. Form divides into grammar and lexis.

Appropriateness means something like 'correct', either in terms of correspondence with the real world (contextual) or of grammatical and lexical acceptability (formal) or of the suitability of the 'type' of information content that is given (mode).

Completeness is the aspect concerned with how much is given or omitted in a reply. This may be in terms of information items (contextual), of grammatical elements and lexical precision (formal), or of the number of different modes used (mode).

Presupposition is relevant to what is given or not given in the answer in the light of what is being, will be, or has already been given elsewhere. This may be in terms of the information that is presumed to be known (contextual). It may be in terms of 'necessary' elements of grammatical structure not given in the answer because they are in the question, or in terms of expounded lexical identification of objects or actions not given in the answer because reference is made back to the specific identifications within the question by the use of substitute words, e.g. pronouns (formal). Presupposition of mode assumes that a certain type of information is required or not required in a given situation.

Context was treated at some length in our previous account (Robinson and Rackstraw, 1972, pp.26-35), but if we are prepared to sacrifice a measure of complexity and precision in the interests of simplicity, we can state that it refers to the relationship between the linguistic and the extra-linguistic, between what is said and what is being talked about.

Mode refers to the variability in the type of answer that is theoretically acceptable. In a given instance there may be contextual reasons which predispose towards the use of one mode rather than another, and frequently linguistic markers separate modes from one another. Hence when judgments are made about the mode of answer selected, context should be taken into account, and when judgements are made about its form, mode will be relevant. Separate modes of answer are applicable to intra-question mode choices, so that a 'how' Mode 3 question offers different answer modes according to manner and process. Different empirical situations may continue to show up new modes of answering for the various question types. In any given analysis of answering behaviour, modes may be subcategorized according to further areas of interest.

Example: Q. Why shouldn't anyone steal?
A.1. Because they get found out and punished.
A.2. Because the people will miss their belongings.

We consider that both of these answers are appeals to consequence, which is a mode. They may be further subcategorized according to whether they are oriented towards: (1) the actor, in this case the subject of the question, viz. 'anyone', or (2) some other. These subcategorizations within mode are related to the specific type of content in the question. Here the content is concerned with a moral justification.

An example showing how a question allows answering across a range of modes will probably help to clarify the idea of mode. 'Where' questions appear to offer three modes of answer.

Example: Q. Where is the Post Office?
A.1. In Stanley Street.
A.2. Two hundred yards from here.
A.3. Next to 'The George and Dragon'.

We call these Modes (1) absolute place, (2) place relative to present location, (3) place relative to some other named point. Mode 1 is not in fact absolute, but is a more 'objective' indication than the other two, and perhaps Modes 1 and 3 should be regarded as approximating to the opposite ends of a continuum of objectivity, while Mode 2 always relates to the present place.

'Why' offers the widest range of choice. It is possible to make a primary division of modes into those which focus on the proposition and those which focus on substance. Originally this was labelled 'focus on empirical data'. This implies an unintended exclusion of questions about logic, aesthetics or morality. 'Substance' hopefully embraces all knowledge. Focus on proposition modes do not require the respondent to know anything about the substance of the topic. Answers like 'Because they do!' (Restatement of question), 'Because I say they do' (Appeal to authority), 'Because they always do' (Appeal to regularity or tradition), 'Because that's the nature of them' (Appeal to essence) can be used with only minimal regard to the content of the question. To answer with these modes the answerer needs only to know a limited set of sentence frames. With focus on substance modes more has to be known. We distinguish explanations employing analogies, categorization in terms of superordinate classes or general laws, causes and consequence. At this point we offer no comment on differential appropriateness lest the problem escalate into philosophy of science.

Form is the linguistic level at which categories are applied to linguistic substance, whether this substance is phonic, consisting of written marks.

Within form, we have a separation between grammar and lexis (described as two demi-levels). Grammar has been defined as 'that part of the study of language which deals with forms and the structure of words (Morphology), and with their customary arrangements in phrases and sentences (Syntax) (Pei, 1966). It is basically concerned with rules governing the selection of items from paradigms offering a limited set of possibilities, and the combination of such selected items into larger wholes (syntagmes). Whereas grammar is concerned with the selection of an item from a limited set, lexis involves selection from sets with very large numbers of members. This may be illustrated within the verbal group:

Example: The boy was hit.

If we assume one interpretation of the meaning of this sentence, the verbal group is 'was hit'. The *grammatical* systemic choices involved in the choice of this verb form include: one within number, where the singular rather than the plural form is selected; one within voice, where the passive rather than active is selected; one within tense, where the simple past perfect is selected. The *lexical* choice involves the selection of 'to hit' rather than 'to miss', 'to thrash', 'to love', 'to shock', and so on through the total list of transitive verbs.

According to Sinclair (1966) a lexical item is 'a formal item (at least one morpheme long) whose pattern of occurrence can be described in terms of a uniquely ordered series of other lexical items occurring in its environment' (p.412). This would make the study of lexis a statistical study. A theory of lexis might be said to contain two categories: collocation and lexical set (Dixon, 1963).

For Sinclair 'lexical set' is something which 'parallels the categories of a thesaurus', a distinct group of frequently associating collocates which presumably could be given a single grouping label (op.cit., p.427)

Collocation seeks to specify the probability for a given lexical item of other items occurring next to it or next but one to it and so on, or else within a certain 'span' of items on either side of a given 'nodal' item.

When specifying our formal criteria for judging whether a given response should be called an answer, we included lexical continuity. We are not interested in obtaining exact probabilities of given items occurring, but with assessing the relevance of the response to the question asked.

Example: Q. Why do the leaves fall off the trees?
A.1. The bag is standing by the door.
A.2. The Hedgehog hibernates in winter.
A.3. The sap goes down and the leaves shrivel and die.

A.1. seems to have no lexical continuity with the question. A.2. is marginal since the two events might be linked by the item 'winter', which collocates with the 'leaves falling off trees'. The third answer, A.3., has obvious continuity, both in terms of collocation and through the repetition of the item 'leaves'.

Comment.

It is not until we begin to write out what we adult speakers know about questioning and answering that we see how much we have learned and how much there is for the developing child to learn! Our analysis has, we hope, exposed the main structure of the problem, but of course the matter could be complicated much further, if we wished to do so and as we have done previously (op.cit., chapter 3). The abbreviated treatment here and its extended version elsewhere help to define the ultimate range of competence that the adult question-asker can achieve with the interrogative devices of the English language. The American work on developmental features helps to specify a route and enables us to make suggestions as to how new forms are incorporated and mastered.

Once we leave the abstract and begin to wrestle with actual answers to actual questions, we immediately encounter the problem of substantive and substantial knowledge. When we test children's knowledge of question-answer relationships, we might choose situations

and materials that obscure the truth. If children give irrelevant, inappropriate and relatively incomplete answers to questions it may be because they do not know the answers rather than that they do not know the rules of the question-answer game. Further, it may be that they do not know or are unwilling to comply with the conventions of the test situation.
How these are relevant to particular pieces of research we shall have to examine en route.

Meanwhile it is necessary to see whether or not there are social class differences in the development of questioning and answering other than the general points already mentioned in the accounts of relationships between the behaviour of mothers and children.

SOCIAL CLASS, ANSWERS AND QUESTIONS.

Explanations for general social class differences in the answering and questioning behaviour of children have been given in chapter 1 and there they were set in a wider theoretical analysis of the intellectual development of children. Here we summarize what appear to be the facts. Why 'social class' and what we hope to capture with this categorization we have indicated in the previous chapter. The labels are based on parental occupations and/or the duration of their education. In our work we were frequently able to define Lower Working Class strongly, with neither parent having done other than an unskilled or semi-skilled job and neither having stayed on beyond the statutory minimal school leaving age. Middle class meant both parents had more than basic secondary education and at least one currently employed in more than a routine white-collar job. Sometimes, however, we had to rely solely on the father's occupation.

An initial investigation with five year olds who were obliged to explain how a toy elephant worked, how to play Hide and Seek, and to choose what to call three paintings showed up class differences with IQ scores controlled (Robinson and Rackstraw, 1972, chapter 5.) Although there were no differences in modes chosen for 'how' questions and no differences in the contextual completeness of the accounts of Hide and Seek, MC children used more impersonal structures for explaining the workings of the elephant (By pressing...) and referred to fewer particular times, places, and persons (especially 'I') in describing how to play Hide and Seek. They included a summary of the game and chose titles for the pictures that caught the theme. LWC children were more likely to choose an item depicted. We would wish to say that the speech of MC children was less concrete and particular, and more de-centered, but this does not look to be specifically related to any inadequacy with questions.

However, a more extended study of seven year olds (Robinson and Rackstraw 1972, chapter 7) did provide evidence of a large number of social class differences in answering. With nineteen non-why questions, the incidence of both grammatical and lexical inappropriateness was low, but LWC children were more likely to exhibit both; their answers also displayed more lexical incompleteness. Similarly, the LWC answers were more likely to be contextually inappropriate and incomplete. With both 'where' and 'when', MC children were likely to use the more generally objective modes of reference, when this was appropriate. To ten 'why' questions, they more often said they did not know the answers, but less often gave replies irrelevant to the questions asked. Appeals to regularity, unspecified authority, along with avoidance of punishment to self were more common in LWC replies, explanations in terms of categorization, cause and effect more common in MC replies. These generalizations were more firmly grounded for girls than for boys.

As a complement to this type of task Rackstraw (Rackstraw, 1970 unpub.) provided ten year olds with answers to questions, and having established that they understood what to do, had them devize questions that would fit the answers. While there were class differences on a number of features, the important difference was in misquestioning. That is, LWC children were more often using an inappropriate 'wh' word for the referential category of the answer. Five WC boys gave 'acceptable' questions to fewer than seven of the thirty six items; only two gave more than twenty five. The MC numbers were none and ten. There were fifteen boys in each group. Definition questions gave particular difficulty. A follow-up study where a choice of two previously prepared questions was required for each answer showed eight year old WC children to differ from their MC peers in their preference for human-centred explanations for a 'why', and definitional 'what' questions. A final study, with ten year olds, again requiring questions to be devized when only the type of answer was defined, showed WC weakness on 'how', 'what... like', 'what kind of', 'what... for', and 'what does... mean' questions.

If we move on from answers and the question-answer relationship to questions themselves, Heber (1974) collected questions of seven year olds about trees, space electricity and other topics. LWC children gave a higher incidence of statements and not questions, their questions had a greater tendency to stereotype (Does it swim?, Does it run?, Does it hop ?), Does it fly?) more deviations from standard or dialect English, and a higher proportion of open, simple, and perceptually based questions as opposed to closed, complex and conceptually based ones.

Bruck (1972) included Bellugi's test of competence at asking questions among the tests of encoding and decoding linguistic and communicative skills in her study of social class differences through time among Canadian kindergarten children. This test requires the child to speak to a doll, e.g. ask the doll when she will perform some action, and the items require a variety of transformations, transpositions, insertions of auxiliaries, and changes in models, pronouns and attached verbs. While the error rates appear to be generally high, averaging nine for only fourteen items, this is misleading, since errors included the whole range of problems referred to above. The only substantial class difference was that WC children were more likely to repeat the items as statements. The MC rate of doing this was negligible, both on entry to kindergarten and after six months there; WC children maintained a rate of over two per child. One suspects that, as with Heber's study, the average is somewhat misleading, being derived perhaps from a combination of a near perfect majority and an incompetent minority.

In a semi-natural child-mother interaction situation in which the child was predisposed towards question-asking, MC six year olds asked more how (degree), 'why' and fewer 'what' questions than UWC children (Robinson and Arnold, 1972). Their questions were more likely to be grammatically complex. There were no class differences in the rate of questioning.

This last result is not supported by the findings of Wootton (1974). Four year olds talking naturally with their mothers provided over one thousand 'why' questions for analysis. MC children asked more than LWC children, and proportionately more of these arose from something said by the mother rather than from some ongoing activity. Tough (unpub.) writes about 'favoured' and 'unfavoured' homes and not about social class, but if we assume a considerable measure of overlap in the categories, we shall not be in danger of great error. Her data on three year olds show interrogative forms used to fill gaps in knowledge relatively infrequent overall, but making up a higher proportion of all questions in the favoured (6.2 per cent) than in the unfavoured group (0.9 per cent). Relative frequencies over all are not reported.

Templin (1957) used books and toys to elicit speech. Of the fifty utterances of each child that were analysed, about eighteen per cent were questions at ages three, four and a half and six, but only eight per cent at eight. At the two younger ages MC children were using more interrogatives, but this was not so at the higher ages.

Comment.

The state of affairs is less informative than we would wish. While the results of Bruck, and Robinson and Rackstraw allow us to conclude that there are social class differences in competence to produce answers, questions and in fitting the two together in test situations, we do not know whether these differences extend to the use made by children of questions and answers in everyday life.

The evidence on relative rates of questioning (and the consequences of this) is sparce. What there is points to a higher rate of questioning in the MC children. That this leads to a greater amount of knowledge being acquired is consistent with the higher scores for contextual completeness in their answers found by Robinson and Rackstraw. Robinson and Arnold likewise found that MC children offered more statements of fact in their tasks. Williams and Naremore (1969), however, found that class differences in initial responsiveness to questions disappeared under probing. LWC children answered the question asked and no more, where MC children would elaborate their responses. Asked whether they had watched TV the previous night MC children would launch off into a description of programmes seen, whereas WC children would say 'Yes'. Robinson and Rackstraw did probe each 'why' question three times, but clearly there are methodological pitfalls which can lead investigators into false inferences.

Sparcity is not the same as absence, and the results obtained are much as would be expected if the developmental story told in chapter 2 is sound. They point to a relative deficiency in questioning and answering skills of lower working class children. Whether this deficiency marks a lag or a difference in orientation to knowledge and knowledge-seeking, we cannot adjudge on the evidence. Whether the difference lies in unimportant linguistic details, important linguistic features, or deep cognitive structures we cannot say. To begin to answer such questions would require much more intensive observation and experimentation, that would include analyses of sanctions employed in relation to and rules governing the judged appropriateness of inquiry behaviours in children. The data reported are almost entirely focused on language in its referential use; the verbal mediation of knowledge as a function of the differential opportunities for acquiring representational knowledge. Norms have been ignored. We have not looked to see how and when parents (or teachers) punish or otherwise discourage questioning, which questions they define as improper, nor whether such interventions merely suppress questioning or begin to stop it happening even inside the head.

Given that we were to engage in some research into questioning and answering of children that was to be helpful and instructive to teachers as well as to psychology, we had to take some preliminary decision about the nature and extent of social class differences in these activities. We could guess correctly. We could make one of two mistakes: assume there were no differences where there were or assume there were differences where there were none. We preferred to risk making the latter mistake. This preference then made it sensible to conduct experiments with groups of children that were socially homogeneous to reduce potential within-group variance. We chose working class rather than middle class children on the grounds that it is their questioning and answering that are more likely to be in special need of education. The processes and taxonomy given in this chapter help to provide guidelines both for experimentation and for any proposed pedagogic intervention.

With the co-operation of the Local Education Authority and an enthusiastic group of teachers from middle schools, we were able to initiate and complete a number of studies of the answering and questioning of first year Middle School boys and girls. The children were 'eight plus' at the beginning of the school year. They were attending schools drawing almost wholly from Council Estate catchment areas. All the internal administration of materials was handled by the teachers with the consequent advantages outlined in the Appendix.

CHAPTER 4.

WHAT KIND OF ANSWER DO YOU THINK IS BEST.

Introduction.

The studies of social class differences in the answering behaviour of five to seven year old children reviewed in chapter 3 can be used to make at least four generalizations. In relation to the rules of Standard English, LWC children were more prone than their MC peers to make mistakes of both omission and commission. Their answers were more often irrelevant to the questions posed. They gave more egocentrically relative answers to 'where' and 'when' questions to which more objective modes would have been more likely to be informative to a wider range of interrogators. In answer to 'why' questions, they used a higher proportion of 'focus on proposition' as opposed to 'focus on substance' modes. Problems of irrelevance in the linkage between questions and answers are examined in chapters 8 and 9. Here we delve a little into the last issue of choice of mode for 'why' questions.

Were the responses we obtained a reflection of habit rather than competence, of performance preference rather than ability? It is possible that LWC children had causal answers available, but chose to make appeals to regularity. That we probed each answer three times and still failed to evoke such causal answers can be used to argue against this being likely. (The children did not weep bitterly subsequently.) Children had ample opportunity to produce more than one mode to each question. It could be, however, that the 'focus on substance' answers are most difficult to construct even if a child knows the relevant content. We think we gave them enough time to think about their answers before they gave them, but we cannot be sure. Another possibility is that the children were ignorant of the substance needed.

Perhaps they would have recognised a better answer if they had met one, but were themselves short of the specific information. To check whether their comprehension and evaluation are indeed effective for handling 'focus on substance' modes, we decided to provide our eight and nine year old WC children with various modes of answer to 'why' questions and have them evaluate them. We did not in fact find out what the children thought about 'focus on proposition' modes, although this could be an interesting matter, especially for social and moral questions. We ignored appeals to analogies and contrasted appeals to immediate causes, distal causes, function and categorization. Children of eight and nine are presumably building up their classificatory schemes. These are becoming sufficiently developed to handle sub-ordinate, co-ordinate and super-ordinate relations, and such children should be able to see that objects can be grouped into various sets according to different attributes, e.g. colour, shape, function, etc. Do they see the assignment of an event or process to a super-ordinate generalisation as a valid answer to a 'why' question? How do they view appeals to immediate and distal causes? Do they still prefer functional explanations? At younger ages children show a preference for human-centred or even self-centred functional explanations of natural phenomena, e.g. the sea has waves so I can swim in it (Piaget, 1930, Robinson, 1973.)

If the attitudes which children express towards these various explanations differ, there may be implications for educational practice. In so far as children learn from other people's answers to their 'why' questions, answers framed in unacceptable modes will be of little educational value, if this unacceptability results in no learning. Favourable evaluations of 'focus on substance' explanations would, if valid, imply the suitability of their use.

Although one might find certain modes of explanation preferred by children of this age, the amount of information they can absorb will also be limited. They may prefer short snappy answers to longer ones. To gain some idea of the amount of information preferred, we decided to offer examples of longer and shorter answers to each question. We ignored difficulty defined in terms of abstraction or generality and concentrated on complexity of syntax and numbers of words. But what standards were we to use? At the easy end we opted for one main clause of a length that children of this age themselves generate. Templin (1957) provides some indication of utterance lengths in children's speech. She found monotonic increases in length from ages three through to eight. Some eight year olds were typically using 7.6 words per sentence, it seemed reasonable to select eight or nine words as a suitable span at the lower limit for our eight and nine year olds.

For the upper limit the problem was more difficult. Templin found 14.15 words as an average for the five longest utterances of eight year olds. Twenty-eight per cent of sentences were compound and complex or elaborated. We thought it appropriate to have a main, a co-ordinate and a subordinate clause and we raised the sentence length to about 19 words, roughly double that of the shorter answers.

Materials constructed with these characteristics in mind were tried out on a small pilot sample of children and found to be appropriate to the purposes in mind.

Our particular reasons for using length and amount of information were based on an interest in seeing whether or not children would prefer to make the extra effort of understanding for the reward of gaining more information. Or would the extra loan overwhelm them? In a previous study (Robinson, 1973), it was found that

MC mothers characteristically provided more information in answer to their children's questions than did LWC mothers. The MC children knew more than the LWC children when posed the same and other questions. When we looked at mother-child pairs the same positive association between mother's provision and child's knowledge was found in the working class, but a reverse trend appeared within the middle class; mothers giving more information had children who gave less. We know from other experimental studies of learning and retention that overloading can lead to a deficit relative to optimal loading. Expressed anecdotally from another study, one five year old asked her mother a question about the stars, 'Why don't you ask your father. He knows all about that ', replied the astronomer's wife. 'Because I don't want to know that much!' was returned by the child. In terms of this investigation, if eight and nine year olds prefer the shorter answers, teachers should check their own speech to find out whether or not they are overloading the children.

In the construction of the materials we faced the hazard that we had to assume equivalence of content as distinct from mode of answer. If children were to show a preference for functional modes, we would have to hope that this was not because the functional answers had better content than the causal ones.

Given that we were to use more than one answer to each question, we also needed to control for the effects of both order and position of different modes of answering. Within the limits of our design possibilities we had to sacrifice one of these. We abandoned order and controlled position, on the grounds that we know from many studies of remembering and learning that there are primacy and recency effects influencing performance, whereas sequence effects have not been shown to occur with our kind of materials.

Method.

Design. To enable us to extract variance attributable to position effects, it was necessary to divide the questions into two comparable sets of four each and to give different versions to each of four groups of children. The first group assessed short answers to set A, then long answers to set B. The second group assessed long answers to set A, then short answers to set B. Group 3 had two long and two short answers to both sets A and B. Group 4 had the same, but with the long and short answers interchanged.

Subjects. Whole classes of first formers (eight plus) in four separate but similar post-war council estate Middle schools gave their judgements. To ease calculations, only the first thirty children on the register of each class were used.

Materials. Eight questions were selected, six referring to biological phenomena and two referring to human social behaviour. The questions were a selection from questions actually posed by eight and nine year old children to their mothers in another study. Selection was based on the ease with which sets of comparable answers could be devised.

For each of the questions, four answers were constructed:

1) An attempt to categorise the particular fact as a member of a higher order set (Superordinate categorisation.)

2) An explanation in terms of the utility or function of the process or event involved (Consequence).

3) An explanation in terms of immediate cause, i.e. a cause maximally contiguous with the event or process (Proximal cause).

4) A weaker (3) but more general causal answer mentioning some more distant or specific influence relevant to only some instances of the problem in focus (Distal cause).

To control for the effect of position, the worry being that first and fourth answers might be preferred to the middle two, the location of each type of explanation was varied from question to question, each type of answer appearing in each of the four positions. For each mode of explanation, two versions were prepared, one long and one short. Short versions averaged nine words in length, and as far as possible consisted of no more than one main clause. Where this was not so, a co-ordinate clause was used. Long versions had twice as many words and consisted of one main and two other clauses, usually one co-ordinate and one subordinate. It would not be proper to claim anything more than that one might reasonably expect the longer explanations to be 'better' but also more demanding in terms of effort required to understand.

The actual items are given below. The labels were not on the original forms. F stands for Functional (Consequence), PC for Proximal Cause, DC for Distal Cause and Cat. for Categorisation.

Short forms: Set A.

Why do dogs bark?

Because a stranger or friend has come up to them (DC)
Most animals make a special noise and dogs bark.(Cat.)
Because something has startled or excited them. (PC)
So as to let you know someone is there. (F)

Why do swallows go to Africa for the winter?

All birds that each insects fly south in winter. (Cat)
They have an instinct that directs them to go. (PC)
So that they have enough to eat and drink. (F)
The cold weather and short days drive them away.(DC)

Why do people sweat?

Because the body gets too hot, and the sweat keeps it cool. (PC)
So as to keep the body at the same temperative (F)
Because they move about too fast in hot weather (DC)
It is one of several ways of keeping the body temperature right. (Cat.)

Why do children quarrel?

In order to get their own way over something.(F)

Because they want to do different things. (DC)

It's one way children can show they disagree with each other. (Cat.)

Because all children get bad-tempered at times.(PC)

Short Forms: Set B.

Why do babies learn to talk?

Because their mothers teach them how to speak. (DC)

They learn many skills and talking is one of them. (Cat.)

Because the brain grows clever enough to learn. (PC)

So that they can speak and listen to other people. (F)

Why do the leaves fall from many trees in the autumn?

All living things die and leaves are living things. (Cat.)

The sap goes down to the roots and they dry up. (PC)

So that the tree can rest safely through the winter. (F)

Because the strong winds of autumn blow them off. (DC)

Why do children eat?

Because their bodies tell them they are hungrey. (PC)

So that their bodies can work properly. (F)

Because their mothers give them food at mealtimes. (DC)

All living creatures need to have food. (Cat.)

Why do people say 'Hallo' to each other?

So that they can greet their friends. (F)

Otherwise people would think they are rude. (DC)

It's one of the things we can do when we meet people (Cat.)

Because they have seen somebody they know. (PC)

Long Forms: Set A.

Why do dogs bark?

When something interesting happens like father coming home from work or strangers calling at the house, dogs will bark. (DC)

Most animals make a special noise. Cats miaow, cows moo, and animals of the dog family bark. (Cat.)

Because they are excited or startled. If they are happy or angry or frightened they will make a noise.(PC)

So that they can show other dogs or people they are pleased to see them - or angry with them.(F)

Why do swallows go to Africa for the winter?

Many birds live on insects. All these birds fly south in winter and the swallow is one of them. (Cat)

When it gets late in the year, this sets off an instinct that tells them to fly south. (PC)

They fly away so that they have enough food to eat for them to stay alive through our winter. (F)

Our cold wet weather kills off all the insects that swallows eat, and this drives the swallows away south. (DC)

Why do children eat?

When their body is short of food it sends messages to the brain and tells them they are hungry. (PC)

Their bodies need food so that everything can work properly and they have energy for moving about (F)

Their mothers give them food to eat for breakfast, dinner and tea and they have to eat it (DC)

All living things need to have food. Human beings are living things so they eat food as well. (Cat.)

Why do people say 'Hallo' to each other?

Because we like to be able to show people we are friendly when we meet them or see them.(F)

Because they have learned that you say 'Hallo' when you see or meet somebody that they know. (DC)

If you saw somebody you knew and didn't say 'Hallo', they would think it odd or even rude. (PC)

We have many words and signs that we can use when we see people and 'Hallo' is one of these (Cat)

Long Forms: Set B

Why do babies learn to talk?

Their mothers speak to them and use very simple words at first. As they grow older they learn more. (DC)

Babies learn to crawl and walk. Talking is one of these skills that we have to learn as we grow. (Cat.)

As the brain grows it is able to do more difficult things. Babies can soon learn to speak. (PC)

So that they can speak with other people and say what they want and what they are doing. (F)

Why do the leaves fall from many trees in the autumn?

All living things die after a time and leaves are alive, so when their time comes they die and fall. (cat)

When autumn comes, all the sap goes from the leaves into the roots and so they dry up and fall. (PC)

So that the tree can rest during the winter and get ready for growing new leaves in the spring. (F)

The winds in the autumn are strong and cold and they flow hard and knock the leaves off. (DC)

Why do people sweat?

There are things call glands in the body and when it gets hot they give out sweat. (PC)

To keep the body at the same temperature, the body gives off the extra heat through sweating (F)

When people run about a lot or move too fast and the weather is hot, it makes them sweat. (DC)

It is one way of keeping our temperature right. Our skin goes red, we pant and we also sweat. (Cat.)

Why do children quarrel?

If two children both want the same thing quarrelling is a way of trying to get your own way. (F)

If two children both want the same thing they can get angry with each other and then they quarrel. (DC)

Children can fight or be rude to other children. Quarrelling is one way of showing you disagree. (Cat)

Because all children get bad tempered with other people sometimes. It's just one of those things that happen. (PC)

It was suggested that rank ordering was too difficult for the children. They were therefore asked to ring whether or not each answer was 'bad', 'all right', 'very good'.

These were given scores of 0, 1, and 2. All items were vetted by teachers, disagreements about children's knowledge of words and other problems were resolved by other teachers checking the items with their children.

Instructions. Teachers were briefed about their particular materials and order of presentation. They were to introduce the task in their own way but were to end with the following comments:

> 'There can be more than ane answer to the same question. If someone asked you 'Who is in charge of this school?", you might say 'The Headteacher' or you might use his name and say 'Mr. Wilson'. If I asked you when you started school you might say 'In 1968' or 'Three years ago' or 'When I was five'. They would all be true.
> I've got two sheets of paper here with some questions and answers on. What I would like to know is what you think of each of the answers written down. I will hand round the first sheet. I will read out the first question and then the first answer and you draw a ring round one of the three words on the right hand side: 'bad', 'all right', 'very good'. Then I'll read the question again, along with the second answer, and so on. There are no wrong answers, I just want to know what you think of each. Is it clear what you have to do?

Teachers were free to explain difficulties in whatever manner they thought best. Items were read as well as written because not all children would have found it easy to read them without help.

Results.

The results are summarised in Tables 3 and 4. The first point to notice, pass over, but not forget, is that the position of an answer within a set had a highly significant influence upon its selection as a good answer (p <.001). Answers in Positions 1 and 3 were more likely to be chosen than those in Positions 2 and 4. While answers in Position 1 were rated half way between 'all right' and 'very good' ($\overline{X}$ = 1.48), answers in Position were rated just better than 'all right' ($\overline{X}$ = 1.22). This result held true for both Short (p <.001) and Long (p <.025) answers, especially for the two Causal modes (Distal, P.<001; Proximal, P <.001)

TABLE 3.

Summary of Ratings of Goodness of Explanations for different Lengths, Positions and Modes of Answer.

Summary of Summed Ratings for all Subject Groups.

AB Summary: Length x Mode

	B1 Dis.Cause	B2 Cat	B3 Imm.Cause	B4 Cons.	Totals
A1 Short	182	155	177	184	698
A2 Long	122	169	166	181	638
Totals	304	324	343	365	1336

AC Summary: Length x Position

	C1 First	C2 Second	C3 Third	C4 Fourth	Totals
A1 Short	189	150	189	170	698
A2 Long	167	142	166	163	638
Totals	356	292	355	333	1336

BC Summary: Position x Mode

	C1 First	C2 Second	C3 Third	C4 Fourth	Totals
B1 Distal Cause	101	64	79	60	304
B2 Categorisation	75	78	79	92	324
B3 Proximal Cause	93	64	99	87	343
B4 Consequence	87	86	98	94	365
Totals	356	292	355	333	1336

ABC: Length x Mode x Position

	B1				B2				B3				B4			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
A1	56	45	53	28	37	34	34	50	51	50	53	43	45	41	49	49
A2	45	19	26	32	38	44	45	42	42	34	46	44	42	45	49	45
Totals	101	64	79	69	75	78	79	92	93	64	99	87	87	86	98	94

TABLE 4.

Analysis of Variance showing effects of Item Length, Item Position and Mode of Explanation upon Judgments of Goodness of Answers.

Source of Variation	Sums of squares	df	Mean Square	F
Between Subjects				
A: Length of item	3.75	1	3.75	
Subjects within groups	22.61	58	.38	9.86**
Within Subjects				
B: Mode of answer	8.51	3	2.83	7.25****
AB	12.61	3	4.20	10.76****
B x Subjects within groups	60.76	174		
C: Position	11.21	3	3.73	9.56****
AC	.94	3	.31	–
C x Subjects within groups	74.73	174		
BC	22.22	9	2.46	6.30****
ABC	16.30	9	1.81	4.64****
BC x subject within groups	207.10	522		
Pooled Error	342.59	870	.39	

N = 120

** means $p < .01$, **** means $p < .0001$

Short answers ($\overline{X} = 1.45$) were more favourably evaluated than Long Answers ($\overline{X} = 1.33$) overall ($p < .01$), but this difference was confined mainly to the Distal Cause mode ($\overline{X}$'s = 1.52 and 1.02, $P < .001$), and it operated most strongly in the preferred first ($p < .05$) and third ($p < .025$) Positions.

There was not an equal preference for all modes. The order of preference was Consequence, Proximal Cause, Categorisation, and lastly, Distal Cause ($\overline{X}F = 1.52$, $\overline{X}PC = 1.43$, $\overline{X}Cat = 1.35$, $\overline{X}DC = 1.27$). This differential preference held for both Long ($p < .001$) and Short ($p < .025$) answers. Differences were significant for all positions, but there was no consistent ordering of modes across these.

Discussion.

Children passed generally flattering judgments upon the answers provided. The mean rating of 1.39 lies nearly half way between 'all right' and 'very good'. At least this suggests that empirical answers are generally acceptable. There is no need for adults to retreat to appeals to simple regularity or tradition when answering children of this age, working or middle class. Neither is there any indication that egocentric explanations remain as the only desirable answers at this age.

Our extraction of a highly significant Position effect serves as a reminder of the importance of including proper controls into experimental work of this kind. Its particular characteristics are somewhat surprising. In experiments on learning and retention, first items generally have a higher probability of recall, and although there is no obvious reason why retention should be confused with ratings of goodness, one might expect children here to be biased in this manner. Do they then feel obliged to produce a contrastive rating on the second, a positive backlash on the third, and another weaker swing back on the fourth? This tenuous suggestion is the best that can be managed on the data available. That the effect is indeed genuine rather than artefactual is suggested by the fact that it occurs for both lengths of answers and for three of the four modes. That the children were not wholly literate and that the answers were read out may have enhanced the effect, although no reason for this can be given.

The preference for shorter rather than longer answers is confined to the Causal answers, particularly to the Distal Causal ones. Distal Causal answers were also the least preferred. Perhaps the children genuinely found them least satisfactory, but it is also possible to interpret this in terms of difficulty of understanding.

If the children had difficulty understanding the connections between these more remote causes and the events they were intended to explain, it may be that the combined difficulty of handling this more remote connection and the longer utterance led to the rejection of the longer answers. Where conceptual and linguistic difficulty combine, the higher effort is not considered worthwhile.

Among the modes Consequences were preferred. In the physical sciences such explanations are usually considered anathema. However none of our eight questions were from physics or chemistry, and perhaps different preferences would be shown with inanimate problems. In the biological sciences, functional explanations still suffer from ill-informed attacks which are based on the assumption that function may imply purpose. Still the children thought they were best ($\overline{X} = 1.52$) and Immediate Causes second best ($\overline{X} = 1.43$). The other modes were not that far behind (Categorisation $\overline{X} = 1.35$; Distal Cause $\overline{X} = 1.27$).

Perhaps the most interesting observation is to note the children's openness to a variety of explanations for a single event. Elsewhere we have drawn attention to the 'one-answer-only' mentality of older children (Robinson, 1974, chapter 10,) and certainly psychology undergraduates at university, and a sprinkling of staff as well, are far from immune from the wish to know which is the best type of explanation. That eight and nine year olds are happy with several suggests that perhaps we, the teachers, mislead them at some later point in time. At these ages they are not necessarily rigidly espousing one best mode and they are prepared to pass favourable evaluations on all the commonly used 'focus on substance' modes. The failures to produce these which were observed in earlier studies may well be a function of ignorance of specific substance rather than a preference for 'focus on proposition' modes as explanations.

CHAPTER 5.

THE GENERATION AND EVALUATION OF QUESTIONS.

Introduction.

In this chapter we ask about the forms of presentation which encourage children to ask questions, and we look also at a comparison between their own questions and their preferences among provided ones. It might be expected that these investigations would be the empirical heart of our concerns, but this is not so. Our main interest has been, and for most of the investigations reported, will remain, in the questioning skills necessary for satisfying curiosity - the ability to pose appropriate questions and to generate and evaluate answers. We recognise however, that the problems of arousing and maintaining curiosity are crucial to a pretending prescription for an education that is to rely on the encouragement of intrinsically motivated learning as well as upon the carrot and the stick. To omit any investigation in this area would look like either ignorance or cowardice.

We set ourselves one very limited problem on this subject of arousing curiosity. Given a topic, could we vary its form of presentation to affect the incidence and types of questions asked about it? If this specific problem can be shown to have sensible answers, then it is reasonable to expect that a whole host of associated issues could be answered with similar experimental designs.

Enquiries made of teachers in other and earlier study groups and encounters for generalizations about ways of arousing curiosity in children had evoked a dismal succession of disclaimers that 'It all depends...' The consensus was that children were wholly unpredictable. What would arouse the curiosity of one set of pupils in one context on one day would have no predictive power for other pupils, other contexts, or other days. That every instance is unique in so many ways is improbable, to say the least. But it could be true, and it can be checked. And it is of course against the behaviour of children, and not against the opinions of teachers, university research workers or anyone else, that the checking must be done. These opinions are invaluable as a source of ideas about likely determinants of curiosity, but they are not evidence for or against answers to these questions. Informed personal opinion is no substitute for empirical results. If we accept, and finally we have to do so, that opinion and ritual must be replaced by faith founded on explicit evidence, we can ask what type of generalization this evidence might yield.

We would not expect universally valid generalizations to emerge. It is unlikely that A's evoke more questions than B's for all children in all situations. But the results from a succession of individual and diverse studies should lead to the accumulation of a body of qualified generalizations. And, as these generalizations proliferate, it is to be expected that the creative imagination of someone somewhere will interpret the generalizations in terms of principles. This picture of inductive accumulation is somewhat misleading. We already have concepts and their confuction in principles. In Chapter 1 (Fig.1) we set out a model of man with concepts linked together, e.g. other things being quiet, incongruous stimuli will generate uncertainty that will be expressed as one or more of several epistemic behaviours, which in some specifiable circumstances will be most likely manifested as questions. Unfortunately the relevant stimuli are relational not categorical. They can only be defined if we know what the person perceiving already knows. But what we need to do is to translate these concepts into their empirical realizations, so that theory and evidence can guide and refine each other. It is early days as yet, and we have only begun to scratch the surface in the search for determinants of curiosity (see Duffy 1974 for a review.)

Possible sources of influence can be quickly listed. Not only the present knowledge of children, but also their attitudes and dispositions, general and specific, chronic and acute, will severally be relevant. So will the past experience of the class, the skills of the teachers, and the nature of the learning problem. We shall ignore all these and look only at materials.

We chose materials and just one aspect of these because they are a current focal point of interest in educational research. The Schools Council has many projects busily devizing and constructing materials. The manufacturers of audio-visual techniques have not been slow to proliferate expensive gadgetry and schemes for the education market. Much of this is intended to be more interesting than earlier materials. Many machine, kits, and schemes have been bought, but few have been evaluated. Of what use is X and is it worth its cost? For X, one can list all manner of goods from language laboratories through reading schemes to sand-trays. But is X useful? Doubtless X helps along the profits of its manufacturers, but before any premature blame is laid upon them, let us remember that manufacturers meet a demand and do not and cannot enforce their sales upon an unwilling buyer. They are culpable only if their claims for their products are inaccurate descriptions or they tell lies about costs and profit margins. That manufacturers do not feel obliged to have their products empirically tested and publicly attested is presumably only because they can sell them without purchasers making such demands of them. If purchasers of equipment in the educational sector refused to buy when there was inadequate evidence for the utility of the equipment, some systematic evaluation might begin to appear. The buyers only have to behave as they would when they buy themselves a car or razor. Why then is such unvalidated equipment bought? There will be many reasons, some involving misguided good intentions, no doubt occasionally associated with enhanced status, fashion, and 'Me-too-ism'. Unfortunately, these are not simply instances of 'caveat emptor'. Emptor is not spending his own, but public money, while part-time teachers and children are left to benefit or otherwise from the machinery and schemes. It is the children who have to be the crucial feature. Will their education be better with X or without it? If X has no advantages over current means, X should not be used.

Hopefully, the creation of the Schools Council will lead to a greater degree of independent and systematic evaluation of schemes and equipment, although optimism is tempered when one sees that some of its own materials have been launched without the necessary warrants of effectiveness.

Meanwhile, just as the white elephants of government defence projects have wasted prodigious sums of money that could have been much better employed, so fashionable schemes for teaching children to read, learn history, do sciences, or speak foreign languages will continue to waste resources that might have been more sensibly deployed. If those who are responsible for dispensing educational 'cures' could come to see the parallels between their behaviour and what would happen to children's health if doctors issued prescriptions for untested medicine with the same abandon, perhaps they would become a little more circumspect in their enthusiasm for the technical panaceas. As successive 'cures' fail, it is also noteworthy that it is the intellects of the children and their home backgrounds that are blamed rather than what happens in the schools, or what society demands of the schools.

This diatribe is occasioned by the fear that the children, the homes, and the psychologists will again be blamed when 'guided discovery learning' and Piagetian theory are shown not to be of use in improving educational standards.

It is more likely that these will fail because they are not understood and their range of application has been overestimated and not checked. And it may be concluded that arousing curiosity is not a useful aspect of educational practice. The reasons for our vested interest in curiosity have been given in Chapter 1. Our concern that it may not be properly exploited is exemplified in the picture of the response-based learning that may come to substitute or it.

But all is not gloom. The Schools Council project on Science 5 - 13 (Schools Council 1971) is a distinct ray of hope. This project is linked to a theory of child development. The objectives of the materials are stated in detail. That the underlying theory may be inadequate and incomplete is relatively unimportant. That the value of achieving the objectives mentioned can be disputed, and that, although detailed, they are somewhat vague are both recommendations. There are possibilities of growth. Amendments to the underlying theory, changes in the nature of or the precision of the objectives can be incorporated. With suitable evaluation and studied use the enterprise can have that organic quality which goalless curricula cannot possess (Harlen, 1973).

If the materials and their use do not encourage the interests and attitudes required of them or if other materials do better, they will presumably be replaced. When other aspects of the curriculum innovation are treated with the same thoroughness, then evaluations of effectiveness can themselves begin to be systematic.

Meanwhile we can at least demonstrate an example of how such an evaluation might be made within a very limited context. In a second exploratory study we look to see whether the questions children themselves produce are related to those they think are good. There is a difference between producing questions which are weak when one knows they are weak and producing these questions but being deluded that they are good. Awareness of and aspiring to standards is not the same as achieving them.

Both appropriate standards of evaluation and the productive capacity are necessary for the eventual fruitful flowering of questioning skills.

Form of Presentation and the Generation of Questions.

Introduction.

Assume a wish to excite children's curiosity about a topic and to have them develop sufficient interest to render their learning about it not only efficient, but enjoyable as well. How does the choice of materials presented to them affect these processes? Will a straight verbal presentation be as interesting as one exploiting diagrams or pictures? Are models or real objects more effective than either? If there are experiments involved, how do children's own manipulations compare with demonstrations by teachers? Are films or radio-talks capable of evoking more interest than visits to factories, fire-stations or forests?

In this instance we did not make any claims about why children should be interested in the topics presented viz., animals. We simply wondered about the differential consequences of introducing them through three different forms: stuffed, photographed and described. We expected some variability in the questions these three would evoke.

Both stuffed and photographic versions display the physical attributes with a clarity that no brief verbal description could achieve. Perhaps the objects and photographs evoke 'why' and 'how' questions about these attributes, whereas verbal descriptions evoke more questions about the attributes *per se*. Or do children ignore the immediately perceptible if it is not put in front of them and ask about behaviour instead? Clearly these are possibilities that might be explored, but we could only derive firm predictions from Berlyne's theory about types of questions if we knew about the past experience and current knowledge of the children. We could then specify what would be moderately complex, incongruous, etc. Similarly with numbers of questions. However, here we did anticipate that the stuffed animals would be more novel and surprising than the photographs or verbal descriptions.

Method.

Design. Children from three schools (A1, A2, A3) on council estates of a similar vintage examined one object, one set of photographs, and one verbal description of the different animals. The order in which the set of animals was presented was constant across schools (Anteater, Wombat, Platypus) so that the order of form of presentation could be varied systematically (see Table 4). This abbreviation precluded the possibility of certain evaluations. Effects due to Position were confounded with Type of Animal. Any use of analysis of variance could only examine Form of Presentation, Sex and either School or Type of Animal position. Since, in the teachers' judgments, children from School A3 were expected to be less 'bright' than those from A1 and A2, whereas we had no reason to expect Types of Animal to differ, Schools were selected as the third uncontaminated source of variance.

Subjects. All the eight and nine year old children in each of one unstreamed first year class from the three schools participated, but subsequently numbers were reduced to eleven boys and eleven girls from each school in order to render both visual inspection of total scores and calculations easier. Alphabetical order gave cut-off points.

Materials. The selection of the three animals was governed by availability of stuffed examples of creatures. We wanted the animals to be comparable in size, easy to transport and fairly unfamiliar and strange. We wanted them to have similarities. Three brownish Australian marsupials were as satisfactory a set as we could achieve and did in fact meet our requirements. To offset the fact that a single photograph limits the observer to a single perspective, we had three 10 x 8" colour shots of each for display: front, side and three-quarter views, all taken from just above the horizontal. For the verbal presentation we tried to confine the information to attributes of the animals that could be seen. Sentences used were simple, and the vocabulary used was judged by teachers and ourselves to be known to the children.

The three verbal descriptions are given below:

1. 'The Anteater is a funny looking creature. His body is about eight inches long, and he has a thick long tail of about the same length. His four legs are about three inches long, and at the end of each foot he has three long curved claws. The claws on his two front feet are much longer and look much sharper than those on his back feet. His body, feet and tail are covered in rough hair of different shades of brown. The funniest thing about the anteater is his long neck and head and very long thin pointed nose. From the tip of his black nose to this body is nearly as long as his tail. The fur on his face and neck is lighter brown than his body and much softer to the touch. He has two tiny ears at the back of his head and orange and black bulging eyes on each side of his head.'
2. 'The Wombat is about the size of a puppy. His fur is short and light brown. Unlike a puppy he doesn't have a tail. On each of his four stubby feet he has five long claws. These look very sharp. His face is like that of a fat rat, although of course much bigger. He has two small pointed ears and two small shiny black eyes. His pointed nose looks as if he is always sniffing round for food. Four sharp looking white teeth peep out beneath it. One of the prettiest things about the wombat is his lovely long whiskers.

3. 'The Platypus is a round fat creature covered in thick soft light brown fur. His head and his body are about a foot long and he has a wide flat tail which is about five inches long, and two inches wide. The platypus doesn't have any legs. Instead he has four large webbed feet, like a duck. These spread out from the four corners of his body. His face is round and furry like his body. Although he has no ears he has two round brown eyes. Also like a duck, the platypus has a beak. This is about two and a half inches long and one and a half inches wide. It is made of a hard dark brown substance, and looks unusual on a furry animal like the platypus.'

Procedure.

With only three schools involved and variation in form of presentation (three values), species of animal (three values) and possible orders and position of presentation (six orders), we concentrated our attention upon the first, retaining the constant sequence: 1st - Anteater, 2nd - Wombat, 3rd - Platypus. This meant that apparent differences attributable to, say species, could not be separated from order and position effects, but these were not the focus of the study. The order of the blocks of instruction differed from school to school, but within blocks the wording remained constant. In no case did teachers merely issue paper and read out instructions. Not only was a normal lesson constructed around the materials, but it was stated that as many questions as possible would be answered - and they were. Teachers were provided with additional information about the creatures. Hence there was little artificiality in the activity. (It proved sufficiently interesting in two schools for this type of activity to be repeated.)

The raw instructions were similar for the three variations. One set only is given:

(Distribute lined paper for each child. Names to go in top right hand corner. Then say)

1. 'I've got a description of an animal here and I'm wondering what you would like to know about it. I'll read you the description and then you write down the questions you would like answered about it. There's no need to think up questions that don't really interest you. Just write down the ones you would like answered. We'll spend ten minutes on it. Here are some copies of what I'll read for you to follow'. This animal is called an anteater (Write ANTEATER on board) (Then follows the description of the anteater. All measurements were demonstrated with gestures. The reading was slow. Children retained copies of the text.)
   'Now you write down any questions you have. Don't worry about spelling. We'll sort that out later!'
   Ten minutes were allowed to write down questions, before proceeding to the next animal.
2. 'I've got the next animal here in a case. Here it is. This is a WOMBAT. (Write on board.) Now what would you like to know about this animal? What questions have you about this one? Write down any questions you have. We'll have ten minutes on it.'
3. 'For the last one, I've got photos of the animal. Here they are (Three children hold up photos, then stand them on the desk.) This is called a PLATYPUS (Write on board.) Now what would you like to know about this animal? Write down your questions. We'll have ten minutes.'

   Collect in all questions.

Treatment of Results.

Since both schools and sex of children were possible determinants of differences found, each was included as potential sources of variation. The statistical treatment was based upon analyses of variance. Features examined were:

1. Total number of questions posed. Since differences were found in the total number of questions asked, scores for

all other problems about types of questions used were expressed as proportions of all the questions asked.

2. Types of Questions as a Proportion of Total Questions. Closed questions allow a Yes/No answer, and typically are constructed by means of a simple grammatical transformation of a statement with the preposing of an auxiliary, e.g. 'Do wombats eat grass?'. Open questions require something more than a Yes/No reply and are typically produced with one of the special 'wh' interrogative markers.

3. Obvious or silly. When we were doubtful we excluded items from this category, but such instances as 'Has it got four legs?' (When confronted by a stuffed anteater) or 'What month of the year does she eat?' were scored as obvious.

4. Materials-centred. These were questions specifically directed to the materials rather than the animals, e.g. 'Who took the photos?'

5. Human centred. These were directed to man's possible exploitation of the creatures, e.g. 'Can you eat them?' 'Can you keep them as pets?'

6. About Physical attributes. It was judged useful to distinguish questions that could be based upon what was immediately perceptible from observation of a static version of the animal, e.g.'What colour is it?'

7. About Behaviour attributes. These questions focused upon the locomotory, eating, fighting etc., activities, not immediately observable, e.g. 'Can they run very fast?'

8. Locational. 'Where do they live?'

9. 'How'

10. 'Why'

Results and Immediate Statistical Inferences.

The data are summarised in Table 5. A cursory examination shows up a likely inadequacy in the design. While we were justified in our fear that Schools might differ in both quantities and types of questions, our hope that the animals would not, proved to be forlorn. The Wombat attracted 37.1

TABLE 5. Numbers of Questions and Proportions of Questions of Various Types in relation to Form of Presentation, School, Sex and Type of Animal.

Form of Presentation	Total Questions Asked	Proportions of Various Types of Questions						
		Closed	Obvious	Physical Attributes	Behavioural Attributes	Location	How	Why
Verbal description	471•	44.1•	14.6•	35.3•	37.0	13.7•	13.8	21.0•
Photograph	466	44.5	13.1	24.6	38.9	21.4	13.4	12.3
Object	530	52.0	22.0	18.2	34.8	16.5	12.6	13.2
School								
A1	579•	54.2	13.8•	26.4	36.2	12.3•	11.0	15.7
A2	482	46.4	11.2	30.8	43.0	15.0	13.5	21.7
A3	406	39.8	24.7	20.8	31.5	25.0	15.3	9.0
Sex								
Boys	638•	43.4	13.5	27.8•	38.0	18.0	18.3•	14.0
Girls	829	50.2	19.6	24.2	35.8	16.4	9.2	17.0
Totals	1467	46.8	16.5	26.0	36.9	17.2	13.2	15.4
Animal/ Position								
Anteater (1st)	454	45.4	11.6	25.8	39.2	19.3	16.4	13.8
Wombat (2nd)	544	47.5	21.0	23.1	35.0	14.4	10.8	13.3
Platypus (3rd)	469	47.5	15.4	27.6	36.5	17.9	10.2	19.3
Subjects	66							

• means that differences are significant at the five per cent level or better.

TABLE 6a. Distribution of Total Questions by Form of Presentation, School and Type of Animal/Position.

	Form of Presentation			Total	Mean
	Verbal	Photo	Object		
School					
A1	186	204	189	579	8.8
A2	167	147	168	482	7.3
A3	118	115	173	406	6.2
Type of Animal/Order					
Anteater/1st	118	147	189	454	6.9
Wombat/2nd	167	204	173	544	8.2
Platypus/3rd	186	115	168	469	7.1
Total	471	466	530		
Mean	7.1	7.1	8.0		

....

TABLE 6b. Summary of Analysis of Variance of Total Number of Questions in relation to School, Sex and Form of Presentation.

Source of Variance	Sums of Squares	df	Mean Square	F	P
Between subjects	2387.2	65			
A Schools	227.9	2	113.9	3.65	<.05
B Sex	184.3	1	184.3	5.90	<.025
AB	102.1	2	51.1	1.63	
Subjects within groups	1873.0	60	31.2		
Within Subjects	74217	132			
C Form of Presentation	38.4	2	19.2	4.05	<.025
AC	79.8	4	20.0	4.21	<.005
BC	22.2	2	11.1	2.34	
ABC	34.6	4	8.6	1.82	
C x Subjects within groups	567.8	120	4.7		

• C at A3 gives F = 10.24, df 2/120, p<.01

....

per cent of all questions, with the Platypus obtaining 32.0 per cent and the Anteater 30.9 per cent. Since animals were confounded with position of presentation we cannot be sure that it was the Wombat rather than the second task being more evocative than the third or the first. However, position effects usually favour first and final positions or give some sawtooth effect (but see chapter 4.) The middle-second position would therefore, if anything, be expected to be relatively weak in its power to evoke questions and since the observed pattern is the reverse of this, reporting results will attribute any such effect to animals rather than to order.

1. Total Number of Questions (Tables 5, 6a and 6b). Both sex and School were relevant to the quantity of questions, girls asking more questions than boys ($p < .025$) and School A1 being higher than A2 which in turn was higher than A3 ($p < .05$). The intersection between School and Form of Presentation ($p < .005$) showed that the Object was particularly strong as a question stimulator in School A3. Inspection of cell totals shows that this may well have been due to the strength of the Wombat. School A3 had the Wombat in Object form, while School A1 had the Photograph, and School A2 as a Verbal Description (see Table 6a).

Form of Presentation had an effect overall as well, with the Objects evoking more questions than either Photographs or Verbal Descriptions ($p < .025$).

2. Proportion of Closed Questions. Objects elecited a higher proportion of Closed questions than either Photographs or Verbal Descriptions ($p < .05$)

3. Proportion of Obvious and Silly Questions. School A3 asked the highest proportion of Obvious questions ($p < .005$), Objects evoked more than the other forms ($p < .005$), while there was a significant interaction between School and Form ($p < .01$) most easily expressed by saying that School A3 was particularly prone to ask Obvious questions about its Object. The destructive action of the powerful Wombat looks to be

at work again. If it is, we could simplify matters down to claiming that School A3 asked more Obvious questions than the other two schools.

4. Proportion of Materials-centred questions. With only six per cent of questions being materials-centred no further analysis was made, except to note that Objects evoked eighty per cent of these questions which were almost wholly confined to Schools A3 and A1.

5. Proportion of Human-centred Questions. Just under four per cent of questions were human-centred, almost none coming from School A3.

6. Proportional Questions about Physical Attributes. Boys asked a higher proportion of questions about Physical Attributes ($p < .05$), especially in response to Verbal Descriptions ($p < .05$). Verbal Descriptions evoked more such questions than Photographs, with Objects evoking the lowest proportion ($p < .001$)

7. Proportion of Questions about Behavioural Attributes. Boys asked a higher proportion of these questions than girls for Objects and Photographs, girls a higher proportion for Verbal Descriptions ($p < .025$), while Verbal Descriptions did not differentiate between Schools, for both Photographs and Objects, School A2 asked the highest and School A3 the lowest proportion of these questions ($p < .01$). Type of animal did not appear to be relevant.

8. Proportion of Locational Questions. School A3 asked a higher proportion of Locational Questions ($p < .001$) while Photographs were strongest and Verbal Descriptions weakest in the strongly significant Form of Presentation effect ($p < .001$).

9. Proportion of 'How' Questions. Boys asked proportionately more 'How' questions than girls ($p < .005$), while a significant School/Form of Presentation interaction ($p < .025$) was most simply interpreted by reference to the power of the Anteater to evoke 'how' questions. Almost all 'how' questions were in fact 'how many' or 'how often' i.e. matters of degree

rather than principle or process.

10. Proportion of 'Why' Questions. Verbal Descriptions evoked proportionately more 'Why' questions than the other two Forms of Presentation ($p < .005$). We may note that the Platypus ascends to top position among the animals. 'Why' questions tended to be about physical attributes.

The profusion and complexity of the results obtained requires some attempt at simplification. The frequent intervention of Sex and School both as main effects and as members of significant interactions raises the question of whether or not there is any general consistency in the results related to School and Sex. This was examined by asking whether or not there is significant agreement across categories of questions in the rank-ordering of sex and school groups, with the underlying assumption that if there is, it may be connected with general intellectual maturity. Accordingly, six categories of question were selected and a Coefficient of Concordance calculated to determine the degree of association overall. This coefficient is like a general correlation coefficient: it shows the average measure of association among several, and not just two, variables. Locational and 'How' Questions were omitted: 'How' questions because the very strong sex difference suggested this was a produce of sex roles and not differential materials, Locational questions because they might well be judged developmentally irrelevant. The rank order of 'Obvious' questions was inverted.

Total number of questions and the proportions of Closed, non-Obvious, Physical Attribute, Behavioural Attribute and 'why' questions agreed in their rank orderings of pupils ($W = .64$, $p < .01$). The actual order being School A2 Girls (B2), School A1 Girls (B2), School A1 Boys (B1), School A2 Boys (B1), School A3 Boys (B1), School A3 Girls (B2). The average ranks of these groups across the six categories were: 1.8, 2.5, 3.0, 3.1, 5.0, 5.5. This puts the girls of School A2 and A1 ahead of the boys, with School A3 at the bottom.

An incidental observation was that it appeared that children who asked many questions with one form of presentation tended to ask many with the other two forms. We checked this for School A1 where the rank order correlations were high and significant (r_s Verbal/Photo = 0.81, r_s Verbal/Object = 0.75, r_s Picture/Object = 0.58, N = 22). In this instance then there were consistent individual differences across conditions.

Discussion.

The abundance of significant differences became a cause of embarrassment rather than joy in that each served as a repetitious reminder of the weakness in the original experimental design. As indicated in the Method section, we would have had to use twenty seven groups of children to examine all the varied factors and their interactions. We would have needed nine groups to look at both Schools and Types of Animal. With only three groups readily available, we chose to assume that Type of Animal would be less influential factor than School and then we confounded its operation with ordinal position of presentation.

Only by good fortune and a careful examination of the diagrams representing the interaction effects were we able to extricate ourselves from the muddle which we ourselves had generated. Our good fortune lay in placing the Wombat in the second position and in the concordance of the School x Sex groups across the six variables. It might be argued that the middle task was most successful in eliciting questions because children did not quite know what to do in the first task and became bored with the third, but we preferred to rely on the general finding that first and last tasks are characterised by higher scores and to attribute the differences found to the potency of the Wombat as a question provoker. Why it should have achieved this eminence we do not know. We would have expected the Platypus and Anteater to be the more evocative creatures both because of their shape and their conjunction of odd attributes, but perhaps more children had actually heard of and seen pictures or T.V. programmes about these anomalies of nature. The Wombat is less well-known (?) and perhaps unfamiliarity evoked more curiosity expressed as questions than did incongruity. Or perhaps the Platypus is not incongruous for nine year olds. One needs to have some knowledge of normally coexistent qualities in different categories of creatures for the incongruities to register. For example, to see a Platypus as anomalous one needs to know that webbed feet and flat horny bills are attributes of birds, while four feet and fur are common attributes of mammals.

The concordance between the six measures of questioning was examined to see whether the effects of School and Sex separately and in interaction with each other and the other factors might be accounted for in terms of some general influence. Its highly significant value suggests that this may be so. If, at this age, higher intellectual maturity is reflected in writing being an easier skill and question generation a more likely or easier activity, then this may well be the underlying reason for many of the relationships found. The higher proportion of hypothesis-testing closed questions, the absence of 'obvious' questions, and by default, the absence of human-centres or materials-centred questions, all point in the same direction.

The complications arising from such an influence have a double import. Methodologically, they point to the value of using homogeneous rather than heterogeneous samples, so that one's results stand out clearly. They also are attribute to the efficiency of analysis of variance as a statistical tool; it is able to partition variance to isolate effects which are far from obvious to the naked eye.

That individual differences in questioning rates across Forms of Presentation were consistent is not very surprising, given the similarity of the three tasks and their contiguity within a single session. However, this consistency makes it reasonable to suggest that Forms of Presentation have general rather than differential effects across individuals; it was not the case, for example, that Verbal Descriptions were particularly stimulating for certain individual children while Photographs stimulated others. Hence, at present, the generalizations do not have to be limited by any complications of this kind.

The three forms of Presentation did influence the questioning of the children. The analyses of the differential proportions of types of question suggest that each form has its merits. Verbal descriptions were less likely to evoke a high proportion of 'obvious' or 'locational' (or materials-centred) questions, but more powerful in eliciting questions about physical attributes and 'why' questions. Likewise, Photographs did not evoke 'obvious' (or materials-centred) questions, but were proportionately strong in eliciting questions about behavioural attributes and location. This latter may have been stimulated by the fact that the stuffed animals were in a perspex case and mounted on wooden plinths, whereas the photographs had more 'natural' backgrounds. While Objects evoked proportionately more 'obvious' (and materials-centred) questions and fewer questions about physical attributes, they evoked more about behavioural attributes, more hypothesis-testing closed questions and more questions overall.

In terms of general teaching aims, 'Objects' won. However, one can imagine situations where questions about physical attributes would be what is being sought by a teacher. Presumably it is because Photographs and Objects make this type of information clearly available that children see no point in asking such questions. The 'why' questions evoked by the Verbal Descriptions were, it will be remembered, mainly about physical attributes. One general principle that can be suggested is that it is as important to select materials that will discourage certain types of questions from arising as it is to encourage others. We are all familiar with the problem of asking pupils or students to pose questions (or give answers) and then they give the 'wrong ones' However these questions may be sensible and valid; they just happen not to correspond to the ones we have in mind. What do we then do? We may ignore, we may smile and mouth a slow 'Yes?' with a tentative rising intonation and quickly pass on. If we fail to recognise the sense and validity of the pupil's questions and responses, we are emphasising the response-based learning mentioned in chapters 1 and 2. If we do this the problem for the pupil has been 'Guess what question or answer I am thinking of', which was hopefully not the problem actually intended. The successful selection of materials can help to ensure that teacher's preferred questions and answers are also the ones most likely to be stimulated by the materials.

If we choose to present actual stuffed animals, we are more likely to be asked about taxidermy, who did the stuffing and who owns the creatures, but we are, additionally, on our evidence, likely to elicit more questions. It is perhaps not a shattering conclusion to reach, that the 'real' thing sparks off more questions than do verbal presentations and photographs, but we do not observe this principle in practice as often as we might. We are perhaps especially tempted to jump in at the more abstract symbolic levels than are justified. In psychology at university this temptation runs rampant. It is very common to miss out the stage of observing the actual phenomena to be described and explained. How many students of psychology have never seen a rat or a monkey or an authoritarian personality or a group taking a decision? (How many lecturers in child development have observed the natural behaviour of the age groups about which they talk and write?) But the same mistake can be made (and its reverse) with young children. Questions are ultimately linked to gaps and conflicts in stored knowledge triggered by experience. The type of experience arranged will affect the Questions generated. If teachers wish children to learn because they are genuinely curious about the world, then the children must interact with the world and not some second or third-hand version of it.

More generally, the three forms did produce differences in both the quantity and quality of questions generated, and hence encourage us to reject the original worry that generalisations would be impossible 'because it all depends..' Hopefully others will engage in much more systematic examinations of the determinants of curiosity in the classroom. It can be done.

Questions Generated and Questions Preferred.

Introduction.

In the previous experiment, we compared the proportions of different types of question produced in response to three forms of presenting an object. We did not go beyond referential categories into any examination of other aspects of quality, perhaps best referred to as level of thinking revealed. This was one interest that had to be pursued a little further.

However levels of thinking displayed in comprehension are not necessarily the same as those manifested in production. We find it easier to criticize inadequacies of top sportsmen than to emulate their performance. We can follow the paths of solutions to mathematical puzzles more easily than we can tread them. To understand the kinetic-molecular theory of gases is not the same as constructing it. In the early development of language skills comprehension is alleged to lead production (Brown, 1973). We might expect questioning skills to be similar. Ability to evaluate may lead ability to produce.

We do no more than explore these problems in an elementary way. The studies reported were in fact trial runs to facilitate the development of the efforts to diagnose and remedy weaknesses in children's understanding of the question-answer relationship which we report in chapters 8 and 9, but they are included because they do help to open up other issues.

What type of information do children of the age and background we are concerned with here seek in following up a topic which has been rather briefly introduced to them?

We have seen something of the questions they ask when they are in free response situations. Two further complementary studies were made which compared free production and constrained choices from the same stimulus material. In the Fixed Alternative condition children chose one from each pair of twelve questions devized by the experimenter. In the Free Choice condition the children devized their own questions. The topic was labelled 'Ants and Honey Ants.' The basic information about the latter was provided in seven simple sentences underneath a drawing of a Honey Ant.

While statistically based statements could be made about the preferences within the Fixed Alternative condition, comparisons between this and the free choice condition have to be confined to comments.

The Fixed Alternative condition could have opposed questions of all manner of combinations derivable from the classificatory scheme for questions set out in chapter 2, just as the investigation reported in chapter 4 examined preferences for causal, functional and categorical modes of answering 'why' questions. Since this was an initial investigation into problems of question preference a less systematic approach was adopted. Consideration was given not only to the distinguishable referential categories, but also to contrasts that might be particularly relevant to eight and nine year old children. Such children should have emerged in their thinking from an egocentric view of the world and their modes of thinking should be becoming emancipated from the particular specific and immediately observable. They should be concrete and not formal operational, however. The following contrasts in content were thought to be useful for exposing interesting differences. Their nature is more fully described in the Method section under Materials: perceptual-conceptual; descriptive-explanatory; specific-general; human-related - other related; directly inferrable - non-inferrable; subjective-objective; labelling - other.

Method.

Subjects. The eight and nine year old children of the classes from two comparable council estate Middle schools took part, each class experiencing one condition only. Twenty three boys and fourteen girls chose questions from the Fixed Alternatives. Seventeen boys and fourteen girls devized their own questions.

Materials. Each class had a foolscap photocopy with a drawing of an Honey Ant. Seven sentences were printed in letters half a centimetre high underneath the picture:

> In the south west part of the United States of America live the honey ants.
>
> They go out and collect nectar from flowers. When they get back to the nest, they give it to certain other ants.
>
> These ants get bigger and bigger as they eat more nectar.
>
> They hang by their legs from the ceiling of a little underground room.
>
> They are living honeypots. They are storing nectar for their sisters.

Response Forms: Fixed Alternatives. Instructions and an example were followed by the twelve pairs of questions each with a half inch square underneath.

Which question out of each pair would you like to know the answer to? If it is the first one, put 1 in the box. If it is the second one, put 2 in the box.

EXAMPLE.

1. When do these ants collect nectar from flowers?
2. Do these ants eat anything else as well as nectar?

NOW DO THESE

A. 1. What colour does the little honeypot become when she swells up with nectar?
2. Could any ant become a honeypot or is there something special about the ones that do?

B. 1. Why is the south west of the United States of America a good place for honey ants?
2. Where else in the world apart from the south west of the United States of America do you find honey ants?

C. 1. Why do the ants collect nectar from flowers?
2. How do the ants carry nectar back to the nest?

D. 1. What exactly does a little roomful of these honeypots look like?
2. How big might the roomful of these honeypots be?

E. 1. Why are ants called insects?
2. Why are honeyants called insects?

F. 1. Why does it say the honeypots are storing nectar for their sisters? Have they no brothers or anything?
2. What happens if the honeypots are given too much nectar? Do they burst or something?

G. 1. How are ants useful to us?
2. What enemies do ants have?

H. 1. Why do the ants that collect nectar give it to other ants and not eat it themselves?
2. Why do these ants store their food like this instead of eating it straight away?

I. 1. How do the other ants get the nectar back out of the honeypots?
2. What is a more scientific name to give to the honeypots?

J. 1. Do the honeypots mind being storage jars?
   2. How do the honeypots hang by their legs from the ceiling?

K. 1. How long do the honeypots hang from the ceiling?
   2. Why are these ants called living honeypots?

L. 1. What other insects are most like honey ants?
   2. What other insects are most like ants?

Response Form: Free Choice condition. A blank sheet of foolscap paper was headed: 'Write down any questions you have about ants and honey ants'.

Rationale of Questions prepared for Fixed Alternative condition. Seven aspects of contrast in content underlay the pairings of questions offered:

1. Perceptual - conceptual
2. Descriptive - explanatory
3. Specific - general
4. Human-related - other-related
5. Directly inferrable from text - non-inferrable
6. Subjective - objective
7. Labelling - other

Elaborations of the meanings of these categories and a listing of the items relevant to them are given below.

1. Perceptual - Conceptual (Pairs A, D & F)

Ashton (1966) used a nine-point scale for classifying questions along this dimension. With the choice of questions under our control, we could reduce the problem to a contrast between information likely to conjure up an immediate, fairly simple, visual image with that less likely to be available for representation in such a manner.

Pair A contrasts a request for a specification of colour with an attempt at a more general analysis of determinants of becoming a honeypot. While pair D are both towards the perceptual and of Ashton's scale, the second question can be answered with an abstract formulation in terms of cubic capacity, whereas the first demands detailed description.

The second question of pair F can be answered with a visually dramatic description, the first cannot.

2. Descriptive - Explanatory (Pair B)

The locational 'where' word requires a descriptive answer , the 'why' question an explanatory one.

3. Specific - General (Pairs E, H & L)

In pairs E and L the questions can be confined to honey ants specifically or raised to the superordinate category of ants in general. Pair H contrasts reasons for storage in specific and general form.

4. Human-related - Other-related(Pair G)

Is the primary interest still in an anthropocentric view of the world?

5. Directly inferrable - Non-Inferrable (Pairs C & K)

The answers to the two 'how' questions can be inferred directly from statements made in the text; their 'why' pairs less so.

6. Subjective - Objective (Pair J).

To find out whether honeyants mind being used as stores would not be possible.

7. Labelling - Other. (Pair I)

Procedure. One afternoon the teacher showed the children the photocopy and said it would be pinned on the notice board until the following afternoon, so that they could look at it if they were interested. At the beginning of the following afternoon the procedures for the two experimental conditions diverged.

Fixed Alternative Condition.

The teacher announced he would be giving each child a form with questions on it.

> 'These are questions all about honey ants. They are not questions you have to answer. You have to choose the questions you would most like to know the answer to. Some people like to know one thing, other people like to know something else. I shall read each one out loud to you. But first of all I'll read out what

is on this sheet of paper.' (At this point the sheet on the notice board was removed, shown to the children again, and read out. Question forms were then distributed.) 'Now each one of you can choose which questions you think are most interesting. I shall read them out two at a time and then you can put a number in the box underneath. If you think the first one I read out is more interesting put a '1' in the box, if you think the second one is more interesting, put a '2' in the box, Let's do the one at the top of the page underneath where it says 'EXAMPLE'. The first question is "When do these ants collect nectar from flowers?" and the second question is, "Do these ants eat anything else as well as nectar?" If you'd rather know the answer to the first question put a '1' in the box and if you'd rather know the answer to the second one, put a '2' in the box.' (The children were given time to do this.) 'Has everybody got a number in the first box? If you really can't decide which you find more interesting, try to - but if you still can't, put a '0' in the box'.

Checks were made that each child had completed the first box and then the twelve pairs were read out allowing time between each for children to fill in the boxes. Children were to be discouraged from thinking some guesses were better than others and that they had to guess which these were. Rather, it was a question of what they would like to know. Children were encouraged to make their own choices. They were promised and subsequently given answers to all the questions.

Free Choice Condition.

On the second afternoon the teacher announced he would be giving each child a sheet of paper.

'This is so you can write down any questions about ants and honey ants that you would like to know the answer to. First of all I shall read this to you again.'

The children were shown the sheet again, the statements were read out and the children then wrote down their questions for the next ten minutes. They were told these would be answered and this was done. The teacher helped children with any difficulties.

TABLE 7

Question Preferences for Fixed Alternative Questions.

Pair	No.	Question Category	Incidence of Responses Boys f	p	Girls f	p	Both Sexes f	p
A	1	Perceptual	7	.1	9	-	14	-
	2	Conceptual	16		5		21	
D	1	Perceptual	11	-	8	-	19	-
	2	Conceptual	12		6		18	
F	2	Perceptual	14	-	13	.002	27	.023
	1	Conceptual	9		1		10	
B	2	Descriptive	11	-	9	-	20	-
	1	Explanatcry	12		5		17	
E	2	Specific	18	.01	11	.058	29	.0014
	1	General	5		3		8	
H	1	Specific	11		11	.058	22	-
	2	General	12	-	3		15	
L	2	Specific	11	-	8	-	19	-
	1	General	12		6		18	
G	1	Human	10	-	12	.012	22	-
		Other related	13		2		15	
C	1	Directly	6	.034	1	.002	7	.001
	2	Indirectly derived	17		13		30	
K	2	Directly	10	-	5	-	15	-
		Indectly derived	13		9		22	
J	1	Subjective	6	.034	2	.012	8	.0014
		Objective	17		12		29	
I	2	Name	14	-	8	-	22	-
		Other	9		6		15	

All p values are for binomial tests.

Results.

Fixed Alternative Condition. Question preferences were analyzed by category with binomial tests (see Table 7.) Only pair F of the perceptual-conceptual choices gave a preference in favour of the perceptual ($z = 2.27$, $p = < .023$). Pair E of the specific-general gave a preference for the specific ($z = 3.25$, $p < .0014$). The not immediately inferrable member of pair C was chosen ($z = 3.59$, $p < .001$) and the objective question of pair J was preferred ($z = 3.25$, $p < .0014$). While all but F were significant for each sex on its own, girls also showed preferences the specific question of H ($p = .058$) and the human-related question of G ($p = .012$).

Comment.

With no baseline for comparison it is difficult to make observations about the results. In so far as the contrasts reflect dimensions of intellectual maturity, the girls appear to be a little less mature than the boys and overall there is no marked preference for the mature choices. This is, of course, a hazardous inference which needs to be examined more thoroughly and systematically than this exploratory study allows.

Free Choice Condition. (see Table 8) Three children produced only statements and one boy's questions were all irrelevant. The average number of questions was 3.26 per child of which 0.81 were closed Yes/No questions and 2.45 Open 'wh' questions.

Closed Questions. Of the twenty five closed questions asked four of those from boys had already been answered in the text. Almost all began with 'Do...?' Six asked about diet, two about stinging capacities, six about the honey and its taste, two about whether honey ants were insects or animals. The other six were about specific pieces of behaviour, e.g. 'Do ants see you?' Hence the majority were about behaviour with an emphasis on feeding.

Open Questions. The seventy six open questions were heavily dominated with 'why' questions (see Table 8) leavened with a sprinkling of 'what... do?', 'what.... is ?' and 'how?(degree)'

TABLE 8.

Number of Open Questions of Different Forms in Free Response Condition.

		Subjects		
		Boys	Girls	Total
Why	(Type	9	14	23
	(Token	23	19	42
	(S's	11	9	20
What	(Type	6	3	9
	(Token	14	8	22
	(S's	6	7	13
How	(Type	2	3	5
	(Token	2	3	5
	(S's	2	3	5
Who	(Type	1	0	1
	(Token	1	0	1
	(S's	1	0	1
Where	(Type	2	1	3
	(Token	4	2	6
	(S's	3	2	5
	N	17	14	31

A substantial minority asked for information already given in the stimulus materials. Only a few were improper, e.g. 'What do some ants call the other ants?' or very vague, e.g. 'What do the honey ants do?'

Ten children related to diet, eight about the name 'Honey ant'. Six asked why the honey was collected, five why the ants grew bigger and five where the ants came from. The remainder were labelled miscellaneous.

1. Perceptual - Conceptual.

Ashton's 'Typical Question Category' analysis was applied to this dimension. This nine-point scale from 1 to 9 gave a mean of 4.05 for the boys and 3.86 for the girls. While an attempt at precise interpretation of these figures would be meaningless, they do show a leaning towards the perceptual rather than the conceptual end, but it could be argued that this would normally be the case in the early stages of inquiry about a new object.

2. Descriptive - Explanatory.

Five children sought only descriptive information, seven exploratory, and thirteen some of each.

3. Specific - General.

Fifteen children confined their questions to honey ants, two to ants in general, and eight referred to both.

4. Human-related - Other-related.

Only four children referred to human-beings at all. Two questions were about honey as a food, three about biting or stinging and one boy wondered 'Do the ants see you?'. (He also asked 'Do the ants make different honey from bees?'.)

5. Inferrable - Non-Inferrable from Text.

If we ignore altogether questions which ask for a repeat of information that was directly given in the text (rather than inferrable from it) we find that two children asked only for inferrable information, nine asked for only non-inferrable and fourteen for both kinds. However, it is worth mentioning that there were ten children who asked at least one question which was to a great extent directly answered in the text and two of these asked only such questions.

6. Subjective - Objective.

Only three questions were marginally subjective.

7. Labelling - Other.

Apart from two girls asking whether honey ants were insects or animals, there were no other requests for labels.

Comment.

Just over three questions per child does not appear to represent a high incidence of curiosity, and it also meant that there were not many questions to examine.

Originally, thirty three children sat down to write questions, but two produced scripts so illegible as to be unanalysable. Three produced only statements, one only irrelevant questions. Two further children asked only questions whose answers could be directly inferred from the text. While they may have forgotten or wanted to check what was there, we might be tempted to ask whether these also might still not see and be able to use questions as a way of finding out new information. If this is fair, over twenty per cent of the children were not up to meeting the task's requirements. Even if the true proportion of normal nine year holds incompetent to ask questions to find out knowledge is as low as ten per cent, this is more than sufficient to merit attention. That the incompetence is not an artefact of the testing procedures would be supported by the reports of similar results by Bruck and by Heber (see chapter 3.) With most of the rest of the questions being expressed in one simple clause of six or seven words, there are no grounds for complacency about any aspect of the results.

Relationships between Fixed Alternative and Free Choice Questions. The data do not admit of close comparisons between the two conditions. It is probably easier to defend an assertion of similarity of results rather one of difference. If we ignore the minority of free questions that were irrelevant, already answered, or not even questions, we can say that many of the remainder related to specific, particular and perceptible features of honey ants and their behaviour, with an emphasis on their biological, especially their eating make-up. These questions focused on the 'what' and 'why' of the behaviour. There was little concern with processes and little interest in the similarities and differences that enter into the classificatory systems human beings create. One suspects that the bulk of the 'why' questions would have been satisfied by functional rather than causal answers, but this we do not know.

Although the free questions revealed an interest in content areas more narrow than these covered in the fixed alternative condition, the intellectual level of questioning was similar. We might have expected the free questions to be more immature, as we have noted children and adults can often comprehend beyond their productive capacities. Possibly they produced questions which were more 'immature' but not very much so. This failure to find a difference would be worrying if it meant that such children will continue just to collect little facts and not process and organize them.

While the investigation shows that children are capable of writing down reasonable and relevant questions about a topic, the questions were simple and short, closely hugging the specific content given. It would seem they have to be encouraged to begin to think operationally about this information.

CHAPTER 6.

IS THIS A SILLY QUESTION?

Introduction.

The review in chapters 2 and 3 summarised our present state of knowledge about the development of question-asking in children. If we ask about the growth of competence to ask individual 'wh' questions, Ervin-Tripp's study (1970) provides a useful framework: her small sample of children had mastered the production of the units and structures necessary for forming questions by the time they were six years old. One would not expect that children with specific disabilities like blindness or deafness or with general malfunctioning associated with various types of subnormality would progress at the same rate. But we might also enquire about particular subcultural groups. Although neither her sampling nor that of Rackstraw (1970, unpub.) or Heber (1974) enables us to say what is normative, the evidence on the questioning behaviour of LWC children suggests at best a lag, at worst what may amount to a qualitative difference between them and their MC peers.

Production, however, is not comprehension. It may be that such children are more adept at distinguishing between well- and ill-formed questions than they are at producing the well-formed variants. While we could have investigated grammatical knowledge by asking children to discriminate between syntactically acceptable and unacceptable questions, we preferred to open up the semantic side. Can children discriminate between sensible and silly or odd questions? Are they aware of the proper collocates of 'why' and 'what'? And if they are, how confident of this knowledge are they?

As these questions stand, they are themselves so general as to be silly, but they serve to introduce one aspect of the problem posed. We did not wish to make social class comparisons, nor could we, since our schools were in predominantly WC catchment areas, but we were interested to see how normal eight and nine year old WC children handled silly and sensible questions. The absence of any sampling controls does not preclude the possibility of making useful estimates.

The distinction between 'silly' and 'sensible' is not categorical in the sense that one can draw up lists to be allotted to one set or the other. What is a sensible question in one context may be silly in another. What is a sensible question from one person may be silly from another. However, although we may recognise that the sense of a question will be a function of the context of utterance, this does not prevent us from claiming that certain questions would normally be silly. There is no implication that silly questions are useless. Philosophers, scientists and other seekers after truth can spend much time trying to find out wherein the absurdity of a certain question might inhere and may eventually decide the question was not absurd at all. One of the articles of faith in the game of pursuing knowledge would state that coming to ask the right question is the main obstacle in problem-solving and would then add a rider that one of the hallmarks of genius is to produce a sensible answer to a silly question. Russell's starting point for his revolutionary work in mathematics was his inability to see why Euclid's axioms were self-evident. Einstein is supposed to have wondered what would be in a dark box if he trapped a ray of light in it. However, if we are prepared to leave the Olympian heights, yet never quite forget that the mouths of babes and sucklings we may be able to distinguish between those 'silly' questions whose occurrence stems from personal and temporary ignorance and those which have some stronger claim to validity.

Knowing that we are treating a relational problem as a categorical one, we can ask ourselves how we as human beings move from an infantile state of now knowing whether or not certain questions make sense to a condition where we are generally competent to pass such judgments. If we look to see what types of 'silliness' eight and nine year old children can and cannot detect, we may be able to pursue the developmental issues from an informed baseline. We might also find that the ignorance of eight and nine year olds is sufficient to make explicit instruction in questioning skills a desirable feature of their education.

As well as opening up these issues, we also wished to see how far children would be influenced in their judgments by the opinions of a credible authority. The literature on attitude change is persuasive in its arguments that changes in opinion and belief are more likely to occur when these are advocated by liked and respected experts (see Karlins & Abelson (1970) for a review). This is particularly so when receivers of communications are unconfident in their judgments. While these facts and those about other relevant variables have been accorded prominence in the studies of the diffusion of propaganda and knowledge through the mass-media (see Katz & Lazarsfield, 1955), they have not been used in studies of the primary socialization of children. Children are inducted into membership of their society and come to subscribe in some measure to its laws, mores and folkways.

En route they ask questions about both the physical and social aspects of their world. They ask questions about tradition and custom as well as about biology and television. When they ask 'Why do people get married?' 'Was Jesus Christ really a superstar?', one style of parenting is to define the question as 'silly'. Questions can also be defined as rude, blasphemous or cheeky. In earlier work we have looked at types of explanation, their differential use by mothers and associated behaviour in children (Robinson and Rackstraw, 1972; Robinson, 1973) and we have argued a theoretical case linking the behaviour of mothers and children. Can children be influenced to say that questions are silly or sensible when they are not? It may be obvious that this is so, but can a mildly delivered afterthought of a remark by their teachers inflence their judgments? And if so, is this related in any systematic way to the type of question whose sense is to be assessed?

To this end we introduced our task requiring children to pass judgments of 'silly' or 'sensible' or 'don't know' upon a series of questions introduced by different instructions from the teachers for different groups.

Method.

Subjects. The subjects were the eight and nine year old children from three classes in comparable schools in Council Estate catchment areas: 35 under instructions with a bias towards expecting many silly questions (Group US) 35 with a bias towards 'sensible' (Group OK), and 29 with no bias (Group DK).

Materials. Thirty invented questions were provisionally intended to exemplify twelve categories, whose separation was arrived at by armchair reflection and discussion. As the evidence and further deliberation were to reveal, the items themselves and their groupings were less satisfactory than they might have been. Each question was followed by the three words - 'sensible', 'don't know,' and 'silly', and children had to ring the word they thought appropriate. These particular words were selected in the light of the teachers' advice: 'silly' was considered preferable to 'odd', 'deviant' or 'improper'. To avoid the influence of response sets, the sequence of the three response words was randomised. The order of questions was only roughly randomised, but simple questions were put early and three of the simple, sensible ones were placed in the first five. All words were judged to be within the recognition vocabularies of the children. The provisional classification was:

(i) Simple, sensible questions. 'Simple' referred to the minimal syntactic complexity of the items.

1. What is the Queen's name?

4. Who invented TV?
5. What is tarmac used for ?
16. How do robins make their nests?
17. Why do some budgies learn to talk?
21. How do babies learn to talk?

(ii) Relational questions. As was mentioned in the Introduction the sense of a question will depend in part upon the knowledge and understanding of the questioner. We may well expect general developmental changes. The question we chose might seem to be sensible to a very young child, less so to one who thought in terms of equal volumes but could only accept the bluntness of the fact, and sense again to one who might be able to understand the difference between the two atomic structures.

8. Why is iron heavier than water?

(iii) Counterfactual hypothetical questions. To consider something which might have been true, but is not, was assumed to involve an exercise of imagination requiring at least concrete operational levels when particular instantiations are readily pictures (Q5,26,28), but perhaps more when the reasoning has to be abstract (Q24). One might expect younger children to attend to the falsity of the hypothetical clause and judge the questions 'silly' on this basis or to fail to understand the question and ring 'Don't know'.

24. If we could read other people's minds, how could we tell lies?
26. If we only had three hours of daylight every day, how would life be different?
28. If we had not got writing, how would schools be different?

(iv) Questions involving nominal realism. There is evidence that children below about five years of age are liable to treat the name of an object as an integral part of it; its name is as much a part of it as its criterial attributes. The arbitrariness of the conventional relationship between sign and significate is generally appreciated by the time children are at infant school, but we guessed that our eight year olds might not be that firmly emancipated from the effect, especially if we had an additional element of group consensus justifying change.

23. If everyone agreed the moon could be called the sun and the sun the moon. we could change the words round couldn't we?

27. If we wanted we could invest a new colour called 'bleen' and say the sky and trees are both 'bleen' couldn't we?

(v) Colloquially acceptable anomalous questions. Assured that Q.6 was no less colloquial than Q.3, we included them both just to see how the children reacted to them.

3. When is Basil Brush?
6. Why is Christmas?

(vi) Questions with interrogative/topic discord. The most elementary forms of 'silliness' that we could think were those where this type of mismatch occurred, e.g. 'who' with an inanimate non-human object or 'where' with an object that could not be located in space.

2. Who is the radio?
7. Where is Daddy's birthday?

(vii) Questions presupposing anthropocentric view of natural phenomena. One characteristic of the preoperational intuitive child is his ego-centrism, one aspect of which is his self-centred utilitarian view of the world. This eventually shifts from anthropocentric views which see nature in terms of its use to man (a not altogether rare view implicit in the behaviour of many adults) to an acceptance of the view that nature just is. Both the questions could be quickly amended to achieve sense, e.g. What are trees used for?, but as they stand, trees just are, they are not for anything. Have eight and nine year olds made this transition?

9. What are rivers for?
13. What are trees for?

(vii) Tautologous and self-contradictory questions. It can be argued that it is impossible to offer a meaningful definition of 'stealing' that does not involve an ascription of wrongdoing, and that it would be impossible to conceive of a society where truth-telling was not considered a moral issue and where lying was positively recommended. Discussions about occasions where 'stealing' and 'lying' would not be wrong are liable to render the above points unclear in two main ways. 'Stealing' can become confused with the question of who is taking what from whom under what circumstances and why. 'It can't be wrong to steal from millionaires because no one has a right to acquire so much wealth' is a misuse of the word 'steal'. Secondly, philosophers often pose moral dilemmas which oppose values of 'stealing,' 'killing' or 'lying', dilemmas which may expose priorities and complexities and may encourage conclusion of 'It would be less evil to lie'. They only encourage answers like 'It would be right to lie' if people insist on assuming (falsely) that any moral dilemma has at least one outcome that is right. But eight and nine year olds are alleged to be concrete and particular, and may therefore fall into such errors!

14. Why is it wrong to tell the truth?
30. Why is it all right to steal?

(ix) Questions based on erroneous beliefs. Some questions can presuppose the truth of a statement which is not true - When did you stop beating your wife? They are not odd unless you know the relevant facts.

15. Why don't whales breathe air?
18. Why do fir trees lose their needles every autumn?
20. How do dogs learn to speak?
22. How do dogs breathe under water?

(x) Questions requiring unwarranted precision. As well as asking for an unequivocal and demonstrable answer for historical questions that can never be so answered, people can ask 'when' 'who' and 'where' questions where the phenomenon has arisen incrementally in unknown fashion - and must have done so. There are also questions which can demand definite answers which cannot be given precise answers either because the phenomena are in a continuous state of change or because no one would bother to undertake a Herculean labour of no significance.

10. Who invented speaking?
29. Who first thought of making musical instruments?

19. Exactly how many hairs are there on daddy's head?

(xi) Questions with insufficient information to answer.

25. If an orange costs seven pence, how much do two apples cost?

(xii) Incomprehensible questions. Questions can just be so weird that one cannot say what might have been intended. With semantic anomalies (v), questions can be re-structured simply to give appropriate meanings, but other questions fall into what might best be thought of as a residual category.

11. Why aren't words pictures?
12. Why don't people speak with their ears?

Instructions and Procedure.

Children were issued with sheets of thirty questions and were required to ring 'sensible', 'silly', or 'don't know' for each question. The questions were read out individually. Three words were written on the blackboard 'sensible', 'don't know', 'silly'. Their meanings were discussed and then the teacher gave the following instructions:

> 'Children ask questions. Sometimes they ask their parents, sometimes their teachers, sometimes other people. When children are very young, their questions can be all right, but they can be funny, senseless or daft, because they don't know how to ask questions properly.
>
> We've got thirty questions some six year old children asked their mothers. I wonder how many of them you think are sensible and how many silly. I will read out the list and you show what you think by putting a ring round one of the three words: sensible, don't know or silly.'

From this point on, the instructions differed for the three treatment groups. Group OK instructions suggested a high incidence of sensible questions, those for Group US a high incidence of silly questions, while those for Group DK (Don't Know) were non-committal:

Group OK	'I'll give out the sheets now. Remember that even children who are only six are pretty good at being sensible, so don't be surprised if you think a lot of the questions are sensible.'
Group US	'I'll give out the sheets now. Remember that even children who are only six still know very little about how to ask questions, so don't be surprised if you think a lot of the questions are silly.'
Group DK	'I'll give out the sheets now.'

Finally children were asked if they had any questions about the activity, and these were answered.

Treatment of Results.

The provisional classification adopted might need to be amended for several reasons. We might think of other ways of categorising types of oddity, but we might also find that others do not agree with the judgements of 'silly' and 'sensible' that we have made. To ask for judgements out of context does encourage a respondent to demand further information, to ask an 'odd' question might normally evoke a 'What do you mean?' reply, making an implicit assumption that sense might be made of the question. Subsequent inquiries of friends made it clear that we were in a small minority for one or two questions, while others were more disputable than we had imagined. As well as a lack of adult consensus, there may of course be general developmental trends. 'Where is God?' might at first make sense and then come to be thought of as improper. 'Why is iron heavier than water?' might be sensible, then silly, then sensible again at successive stages of development, it depends what knowledge underlies the question.

With these hazards about us, we decided to take account of the children's opinions. Say, for example, 80% of children were to think each of the six items in the sensible sample category was sensible, then the category could be left as it stands. Should one item be judged 'silly' by 80% it would be dropped. That is, only where items in a category are relatively homogeneous in terms of the proportions of judgements of particular types will they be retained in the original group.

Where responses by individual items were contrasted, X^2 was used, but for the sake of simplicity, calculations were restricted to the comparison of the 'US' and 'OK' groups. Where summed items were used, X^2 was again employed with th cut-off points being decided in such a way as to best express the nature of the distributions.

Results.

(i) Simple sensible questions (Q's 1,4,5,16,17,21) (Table 9) There was a consensus of opinion about the sensibleness of these questions. However, 43% thought at least one item was silly, and as Table 9 shows, more of these were in the US Group, then in the OK Group, while OK and DK Groups were more likely to confess to uncertainty.

TABLE 9. - Incidence of Judgements of Sense of Questions by Groups with Different Instructions for Simple, Sensible Questions (Sum of Q.1,4,5,16,17,21).

Responses.

	Silly	?	Sensible	> 0 Silly		> 0 DK		All Sensible		n
Group		%		✓	✗	✓	✗	✓	✗	
US	16.1	7.8	76.1	22	13	10	25	10	25	35
DK	8.7	16.2	75.1	11	18	17	12	7	22	29
OK	5.7	10.0	84.3	10	25	16	19	15	20	35
All Groups	10.2	11.1	78.8	X^2US/DK= 6.97		X^2US/OK =1.53 X^2US/OK +DK 4.33		X^2US/OK = 1.00		

✓ means number of children giving response in heading, e.g. 22 children out of 35 (n) said that at least one of these six questions was silly; ✗ means the number not giving that response.

(ii) Relational Questions (Q.8) (Table 10)

Children distributed their judgements about this item, but relative to Group US, Group OK were more likely to say that it was sensible or that they were unsure.

TABLE 10. Judgement of Sense of Relational Question (Q.8).

Group	Responses Silly	? %(n)*	Sensible	n
US	68.6(24)	8.6(3)	22.9(8)	35
DK	24.1(7)	24.1(7)	51.8(15)	29
OK	25.0(8)	25.0(8)	50.0(16)	32
All Groups	40.6	18.7	40.6	
X^2 US/OK	11.0	2.1	4.2	

(Raw frequencies in brackets.)

(iii) Counterfactual hypothetical questions (Q's 24, 26, 28) (Table 11)

The three questions in this group did not give similar distributions. Question 24 about lying if we could read other people's minds was judged silly by 59% of the children. Group US (66%) was very similar to Group OK (54%). By contrast, only 40% of the children thought Q's 26 and 28 silly. Group OK was less likely than Group US to think both questions were silly, and more likely to assume one was sensible or were uncertain about one.

TABLE 11. Judgements of Sense of Conceptually Difficult Questions (Q 26, 28).

Responses

Group	Silly	?	Sensible	Both Silly		> 0 Uncertain		>0 Sense		n
		%		✓	✗	✓	✗	✓	✗	
US	55.9	16.2	27.9	15	20	8	27	14	21	35
DK	43.1	37.9	19.0	7	22	10	19	8	21	29
OK	21.7	36.2	40.0	1	34	18	17	22	13	35
All Groups	40.0	29.7	30.3	X^2US/OK=13.70		X^2US/OK=4.96		X^2US/OK=2.80		

(iv) Questions involving nominal realism (Q's 23 27) (Table 12)

In spite of Q.27 being potentially more difficult that Q.23 both were judged similarly, although the majority of children thought that each was silly. However, Group US were more prone to judge both silly and less likely to confess to uncertainty on either.

TABLE 12. Judgements of Sense of Sensible Questions Involving Nominal Realism (Q.23,27)

				Responses						
Group	Silly	? %	Sensible	Both ✓	Silly x	>0 ✓	Uncertain x	>0 ✓	Sense x	n
US	81.1	7.2	11.6	23	12	5	30	6	29	35
DK	68.4	19.3	12.3	13	22	18	19	5	24	29
OK	55.7	30.0	14.3	13	16	10	19	8	27	35
All Groups	68.3	18.9	12.8	X^2US/OK=4.63		X^2US/OK=6.80		-		

(v) Colloquially acceptable anomalous questions (Q's 3,6) (Table 13)

More children in Group OK than in Group US judged these as silly or were uncertain.

TABLE 13. Judgements of Sense of Colloquially Acceptable Questions (Q's 3,6)

				Responses						
Group	Silly	? %	Sensible	Both ✓	Silly x	>0 ✓	Uncertain x	>0 ✓	Sense x	n
US	44.6	3.1	52.3	5	30	2	33	25	10	35
DK	59.6	22.8	17.5	11	19	11	18	10	19	29
OK	67.7	19.1	13.2	13	22	10	25	12	23	35
All Groups	57.3	14.7	27.9	X^2US/OK=3.66		X^2US/OK=4.93		X^2US/OK=8.26		

(vi) Questions with interrogative/topic discord (Q's2,7)

100% of the children judged 'Who is the radio?' silly and although the trend for Q.7 was in the expected direction, the 88% judgement of silliness was high enough to make any group differences improbable.

(vii) Questions presupposing anthropocentric view of natural phenomena (Q's 9, 13) (Table 14)

Although there was some divergence between the items, with more children thinking Q.13 foolish than Q.9, and with Group US making more judgements of silly ($X^2 = 11.54$, $p < .05$), and fewer of sensible ($X^2 = 4.79$, $p < .05$) than Group OK on Q.19, the trends for the two items combined are consistent with other results.

TABLE 14. Percentages of Judgements of Sense of Anthropocentric Attributions to Natural Phenomenon (Q's 9, 13)

Group	Responses							
	Q9			Q13				
	Silly	? %(n)	Sensible	Silly	? %(n)	Sensible	Both Silly ✓	X
US	64.7(22)	15.9(2)	29.4(10)	48.6(17)	5.7(2)	45.7(16)	25	10
DK	31.1(9)	20.7(6)	48.3(14)	20.7(6)	17.3(5)	62.1(18)	12	17
OK	20.6(7)	24.6(7)	58.8(20)	38.2(13)	11.8(4)	50.0(17)	15	20
All Groups	39.1	15.5	45.3	36.7	11.2	52.0	X^2US/OK=2.60	

(viii) Tautologous and self-contradictory questions (Q's 14, 30) (Table 15)

There were no significant differences among the groups, with items separate or combined.

TABLE 15. Percentages of Judgements of Sense of Tautologous and Self-contradictory Questions (Q's 9, 13)

Group	Responses					
	Q 14			Q 30		
	Silly	? %(n)	Sensible	Silly	? %(n)	Sensible
US	71.4(25)	8.6(3)	20.0(7)	74.3(26)	8.6(3)	17.1(6)
DK	65.6(19)	13.8(4)	20.7(6)	89.7(26)	3.5(1)	6.9(2)
OK	64.7(22)	11.8(4)	23.5(8)	76.5(26)	11.8(4)	11.8(4)
All Groups	67.3	11.2	21.4	79.6	8.2	12.2

(ix) Questions based on erroneous beliefs (Q's 15, 18, 20, 22) (Table 16)

Of the four questions in this category, one (Q.18) was generally endorsed as sensible, while another was considered by a high proportion of children to be 'silly' (Q.20) The other two provoked more variation of response, but with the 'silly' category being most commonly endorsed. For these two, Group US were less likely to admit to uncertainty. ($X^2 = 3.99$, $p < .05$).

TABLE 16. Judgements of Sense for Items Based on Erroneous Beliefs (Q's 18, 20, 15, 22)

Group	Responses					
	Q18			Q 20		
	Silly	? %(n)	Sensible	Silly	? %(n)	Sensible
US	29.4(10)	17.6(6)	53 (18)	85.3(29)	8.8(3)	5.9(2)
DK	31.1(9)	20.7(6)	48.3(14)	72.5(21)	20.7(6)	6.9(2)
OK	44.1(15)	14.7(5)	41.2(14)	77.1(27)	17.1(6)	5.7(2)
All Groups	35.0	17.5	47.4	78.3	15.3	6.1
	Q15			Q 22		
	Silly	?	Sensible	Silly	?	Sensible
US	63.6(21)	15.2(5)	21.2(7)	60.6(20)	9.1(3)	30.3(10)
DK	48.3(14)	9.1(3)	41.4(12)	31.1(9)	21.4(6)	7.9(5)
OK	35.3(12)	35.3(12)	29.4(10)	48.6(17)	22.9(8)	28.6(10)
All Groups	48.9	20.8	30.2	52.6	19.3	28.1

Distribution of Frequencies (Q's 15,22)

Group	Both Silly		>0 Uncertain		>0 Sense	
	✓	x	✓	x	✓	x
US	12	23	6	25	15	20
DK	11	18	8	21	13	16
OK	7	28	13	22	18	17

X^2 US/OK = 3.81

(x) Questions requiring unwarranted precision (Q's 10,19 29)(Table 17)

The provisional grouping of items was rejected by the children with 82% saying it was sensible to ask who first invented musical instruments. The vast majority thought the other two questions silly, but there were no differences of significance between the groups.

TABLE 17. Incidence of Judgements of Sense of Questions Requiring Unwarranted Precision(Q's 10, 19)

Group	Responses					
	Q 10			Q 19		
	Silly	? %(n)	Sensible	Silly	? %(n)	Sensible
US	82.3(28)	5.9(2)	11.8(4)	88.6(31)	0(0)	11.4(4)
DK	86.3(25)	3.5(1)	10.4(3)	69.0(20)	20.7(6)	10.4(3)
OK	55.9(19)	32.4(11)	11.8(4)	85.7(30)	2.9(1)	11.4(4)
All Groups	74.2	14.4	11.3	82.6	7.1	11.2

X^2US/OK=4.15 X^2US/OK=6.79

(xi) Questions with insufficient information to answer (Q.25) (Table 18)

Oddly, to ask the price of two apples was not considered overwhelmingly silly when given the price of one orange.

TABLE 18. Incidence of Judgements of Sense of Question with Insufficient Information to Answer (Q.25)

Group	Responses		
	Silly	?	Sensible
US	44.1(15)	20.6(7)	35.3(12)
DK	55.2(16)	17.3(5)	27.6(8)
OK	34.3(12)	25.7(9)	34.3(14)
All Groups	43.9	21.4	34.7

(xii) Incomprehensible questions (Q's 14, 30) (Table 19)

Both strange questions were held to be silly, with no significant group differences, but a tendency for Group US to claim both questions were silly relative to Group OK (X^2 = 2.80).

TABLE 19. Judgements of Sense of Incomprehensible Questions (Q's 14, 30)

Group	Responses					
	Q14			Q30		
	Silly	? %(n)	Sensible	Silly	? %(n)	Sensible
US	74.3(26)	11.4(4)	14.3(5)	91.4(32)	0(0)	8.6(3)
DK	72.5(21)	20.7(6)	6.9(2)	89.7(26)	0(0)	10.4(3)
OK	91.4(32)	5.7(2)	2.9(1)	94.3(33)	5.7(2)	0(0)
All Groups	79.8	12.1	8.1	91.9	2.0	6.1

Discussion.

For the majority of the categories used, the responses of the children showed significant differences attributable to the instructional set presented; eight of the twelve categories gave differences. Of the four which did not, the interrogative/topic anomaly pair (Q's 2, 7) and the incomprehensible questions (Q's 14, 30) were distinguished by receiving very high proportions of judgements of 'silly' viz. 100%, 88%, 80% and 92%. It would appear that so many children were confident in their opinions about these items that the instructions were ineffectual. However, it is worthy of note that a comparably high incidence of acceptance of the sense of the single, sensible questions (78%) did not prevent group differences from emerging. Whether such asymmetry is worth pursuing isnot clear. Are children more sure of what is silly than they are of what is sensible? Or could the asymmetry be explained by the instructions suggesting a high incidence of silliness being more powerful than those favouring sense; some evidence for this latter view is given below. The failure to find differences on the other two categories is less amenable to this interpretation. The tautologously true and self-contradictory items were thought silly by a large majority of the children (67% and 80%) but one wonders whether they arrived at these judgements by the same reasoning processes as the experimenters. With the evidence to hand we cannot say. Neither can we say why nearly 35% thought it was sensible to inquire about the price of oranges, when only the price of apples was given. It is tempting to suggest that they based their judgements on the general reasonableness of the question and simply ignored the conventionally acceptable constraints of mathematics questions; it was after all, the only question of this type in the set.

Two other categories deserve special mention. The four questions predicated on erroneous beliefs failed to form a homogeneous set. Q.20 yielded a high proportion of 'silly' judgements (78%) and its failure to yield differences may be explained in terms of this high confidence. The responses to Q.18 suggest that more children thought fir trees lost their needles in the autumn than were unsure or disagreed. The US group in particular were likely to think it a sensible question (53%) and the one simple interpretation would attribute the distributions mainly to the ignorance of this group. Or, of course, we could say it was a bad question, since, as it is worded, it is in fact sensible, but misleading.

'Who first thought of making musical instruments?' was distinguished from its potential stable-mates by being generally judged as sensible. Subsequent inquiries of colleagues supported the children's opinions against the experimenter's earlier presumptions.

Overall, the results point with general consistency to the sensitivity of children's judgements to the instructional sets given, with a reservation that high levels of initial confidence will be less susceptible than lower ones to such influences.

But did the children really understand and accept the constraints of the task? One index is the no-response rate which, at 1.5% is sufficiently low to warrant a measure of faith in the responses given. The teachers anticipated and reported that the children understood the task. The results themselves were not random. An original worry that the children would tend to tick 'Don't know' if they did not know the answer to a question seems to have been without foundation.

We have no direct information about the reliability of the responses, and although the technique clearly worked, intelligent interviewing might have revealed more about such aspects as the degree of confidence children had in the judgements they made and their reasons for making them, the circumstances when the question offered might have been sensible even though it might usually be silly and the children's ways of categorising types of oddity. Would they see similarities and differences corresponding to those invented?

However, with what we have, we need to ascertain what kind of shifting occurred and for which items in particular this happened. It has already been suggested that where precentage agreement of judgement is high, confidence will be high enough for children to remain independent of instruction. This would be necessarily true if percentage agreement were taken across all groups for extreme values only: if 100% agree, there is no variance to explain. But we might expect that it would be among items which showed minority proportions of each response rather than those with 70-80% agreement within a group, that judgements would be most readily influenced. Inspection of the data shows this to be untrue. For example, although the simple, sensible questions were judged to be so by 79% of the sample, they yielded between group differences, whereas the presumed human-centred explanations for natural phenomena with 45%

as the largest measure of response agreement gave no difference. In certain, methodological, respects, this is encouraging. One type of situation in which instructions can be peculiarly effective is where most people do not know. The instructions can then give a bias in one direction or another, so that all one does is pull a number of respondents out of uncertainty. That we found shifts where group agreement in a positive category was as high as 80% would help to refute such an interpretation; so does the low incidence of 'Don't know." From what can be seen, to shift or not to shift does not seem to be systematically related to the proportion of judgements in any simple way.

If we ask which categories showed shifts, we see that what were intended to be sensible questions shifted as readily as those which were intended to be silly, although the simplest silly did not shift in the same way as the simplest sensible. While statistical comparisons were not made between the amount of shift in simple as opposed to complex questions the supposedly difficult counterfactual hypothetical sensible questions did appear to yield more pronounced differences than the simple sensible ones. With the 'silly' questions it is not possible to talk about such degrees of difficulty. It was somewhat surprising to find 68% of the responses of eight and nine year olds still apparently subscribing to some form of nominal realism. Both involved group consensus as a basis for the meaning of symbols as well as re-naming, while Q.27 additionally included reclassifying with the elimination of a common distinction. There were slightly fewer responses (10% vs. 15%) in favour of the sense of Q.27, but the drop is not dramatic. Similarly the incidence (45%) of the acceptability of 'What are X's for?' seemed to be higher than expectation for eight and nine year olds. However, a defence of the inappropriateness of human-centred explanations for natural phenomena was alleged to be pedantic and puritannical rather than precise and proper in subsequent assorted dialogues with adults. The remaining items have either been mentioned already or are not particularly noteworthy. Apart from the examples mentioned, there do not appear to be any categories of question that occasioned peculiar difficulty, nor is there any systematic variability in sensitivity to persuasive instructions among the categories of 'silly' questions.

Given the shifts of judgement occur which from response categories gain or lose cell entries. The total percentages of judgements for each group (see Table 20) is most simply interpreted by pointing to the similarities for 'sensible' across the three groups and the difference between Group US and the others for 'silly' and 'don't know' and then arguing that the instructional bias for 'silly' shifts judgements from uncertainty into the silly category.

TABLE 20. Percentages of Silly, Uncertain and Sensible Judgements for all Questions for each Treatment Group.

	% Responses		
Group	Silly	Uncertain	Sensible
US	56.2	8.6	35.1
DK	48.9	17.2	33.9
OK	44.4	18.0	37.7

Evidence for the 'sensible' instructions having any strong effect overall is weaker, although Group OK has a non-significantly lower percentage of silly and a higher one of sensible judgements than Group DK.

This positive pattern is similar if one looks at individual and grouped questions; group OK being generally more like group DK than group DK is like group US. However, the responses of group DK are fairly consistently intermediate between group US and OK. Hence, the simple hypothesis of the 'silly' bias being influential is clearly supported; the 'sensible' bias appears to have had some effect also.

It is perhaps unfortunate to have clouded the issue by having such a variety of questions in the materials; the overshadowing effect of there being correct, incorrect and doubtful answers to the items may have clouded distinctions that might have been made. On the other hand, separate analyses to examine whether instructions had different effects judged 'sensible' and 'silly' questions, revealed no differential patterns.

Without knowing more about the grounds upon which children based their replies, we would be foolhardy to elaborate our interpretations further. While remembering the limitations of our techniques and sampling we can draw some conclusions which have implications for both research and teaching.

On the research side it would be instructive to find out how it comes about that a substantial minority (in this case 20%) of nine year olds are not able to recognise that the simplest sensible 'wh' questions are sensible and within the set of 'wh' questions, the development of an understanding of the appropriate collacates of 'how' and 'why' questions probably merit special attention. Although we have made no contribution to knowledge about the way in which children come to accept appeals to regularity and tradition as legitimate answers to questions about social conventions and customs, the study of questions about these could be particuarly interesting. We have seen that the statement of a credible authority figure can affect judgements of sense. How far is primary socialisation but a massive extension of this operation of such authority, producing acceptance without understanding.

Why are children so loathe to say they do not know whether a question makes sense or not? While various forms of conflict among schemas and between schemas and the results of actions are a basis for development and learning and there is nothing untoward about children having hypotheses which are later found wanting, it is important to distinguish between ignorance based on some kind of cognitive limitation and that based on misinformation. To know that it is Paris and not Berlin that is the capital of France does not require greater cognitive capacity of the child in the same way that knowing there must be more flowers than tulips in a bunch of mixed blooms requires more capacity than if you have two apples and are then given two more, you will have four. To rely on limited rules which often work but occasionally generate wrong answers is different from believing statements that you do not even understand. The development of children's handling of uncertainty is being studied (Turner and Pickvance, 1971; Shields, 1971) mainly in relation to the use of modal auxiliary verbs and qualifications of thinking, supposing and wondering.

From the practical perspective, we are reminded by the results of the power that teachers have to define the worlds of their pupils: 'Teacher says, so it must be so'. And if the teacher is wrong, so will the children be. The teachers in the group were surprised that what seemed to be only a minor manipulation of instructions, a casual afterthought, should produce such significant effects. We can but repeat the dull but true injunction that teachers should realise that whatever they say may influence what children come to believe.

We still have no idea how frequently sensible questions of children are dismissed in this way. Neither do we know whether such dismissals would suppress overt behaviour, but leave the curiosity unaffected. At least the succeeding generations will continue to probe the status quo of society, reminding us that institutions need to be justified and occasionally expose adult hypocrisy.

CHAPTER 7.

QUESTIONS AS AN AID TO LEARNING.

Classroom proceedings remain something of a mystery in spite of extensive reviews of the literature on classroom interaction. There are many reports which contain counts and classifications of the utterances of teachers and pupils, and from these it is safe to say that teachers ask a lot of questions. For example, Bellak, Kliebard, Hyman and Smith (1969) found that approximately three quarters of their teachers' utterances were questions. What are these questions intended to achieve? Are they in fact effective? Would some other tactics be more so?

Teachers are testing pupils' knowledge with questions, they are checking whether the pupils are attending. The imminence of questions may help to maintain attention and concentration. Although we do make reference to these functions, we are concerned mainly with questions as possible stimulations to learning.

Lecturers as well as teachers employ the question to inspire enthusiasm. As we strut and fret our hour upon the stage - and then are heard again next week - many of us assume that, underneath the normative mask of indifference, the apparently bored hordes are excited. Bligh (1972) has reviewed studies of lectures and finds that they do not inspire students to read, think, or even ask questions. He concludes that '... they can be used to teach information, including the framework of a subject, but an expository approach is unsuitable to stimulate thought or change attitudes' (p.223). While lecturers will continue to believe otherwise, without testing their beliefs against their students' behaviour, we need to consider what Bligh says seriously. One common tactic to give fire to lectures is to pose questions, hopefully to arouse curiosity. Perhaps these questions are of no use.

Our representation of epistemic man in chapter 1 contained the sequence 'curiosity questions' as a link in a longer chain, and we went on to argue that learning was promoted by questions arousing curiosity. Two problems arise. Can we dispense with the curiosity and start with questions? Can 'questions' be given a little feedback loop to curiosity, so that questions from outside oneself can arouse curiosity, become one's own questions and lead to learning?

We designed two experiments to look into these possibilities and we shall reserve further discussion until these have been reported.

Which Posters are Noticed?

Introduction.

Nationalised industries, marketing boards, public companies and other bodies prepare wall-charts for use in schools and colleges. These differ considerably in the amount of pictorial and written information presented. Some are diagrammatic, others photographic. Almost all are in colour. Some are accompanied by explanatory booklets for teachers to use. Some are stated to be particularly suitable for children of particular ages.

We were initially interested only to evaluate the relative efficacy for learning of three different ways of presenting the written material, but as our collection of charts grew and we examined them, we were forced to ask some more general questions. Of what educational value are wall charts? What are their objectives? Are the means employed efficient to these ends?

We were not favourably impressed and passed a tentative judgement that many charts would have no educational value. Some presented scattered snippets of information unconnected with each other and only loosely associated with the apparent theme. We thought there was a negative correlation between artistic merit and educational worth. Designers had seemingly sacrificed utility to their pictorial muse. Such posters could have served as exemplars of good design in art lessons, but that was all. Other charts had more small print than the conditions on insurance policies. Some just failed to make sense; the manufacturing process portrayed was impossible, invisible or incomprehensible (at least to us). Yet others showed little artistic sense, with minimal appreciation of problems of balance, colour or shape. They failed to allow the important to stand out from the trivial.

We had no wish to arrive at these harsh judgements. We make them in regret not anger and must, of course, concede that our impressions are worth no more than those of other individuals. The only sensible way of answering questions about the design of wall-charts is to try various forms out on the consumer! If they are intended to catch the eye, what is eye-catching? If they are intended to facilitate learning about some problem, which features facilitate or which impair learning? What motivates children to find out more than is on the chart? These are all empirical problems, where finally satisfactory answers can be obtained only by defining the objectives of the chart, and then evaluating variants of it used in a variety of ways.

It is therefore a matter for regret that the good intentions of chart producers are not translated into demonstrable effectiveness, especially since the expense of preliminary evaluations would presumably be small, relative to the expenditure involved in the production of the wall-charts themselves. It should also be relatively easy to accumulate some tested principles of design, along with tested 'rules of thumb', that could be made available both to other designers and to teachers. What public companies do with their money is their responsibility, but the keepers of nationalized industries might feel obliged to ask whether their investments are in the public interest.

As far as our purposes were concerned we were happy to use some charts of the National Dairy Council. These had the advantage that they could be readily adapted to the experimental design; there were three charts; comparable in topic, amount and level of information. Further, the group of teachers agreed both that they were the best for the eight and nine year olds and that they were good. Additionally there were useful teachers' notes which contained more detailed information than the charts themselves.

Under normal circumstances the teachers in the group would have used wall-charts differently. They would have exploited them as one visual aid among others in the development of a small project. There were two reasons why we did not create this normal situation. The first was that to have asked the teachers to mount a whole project would have been an unwarranted imposition. Additionally, there would have been inter-teacher variation between projects, and this we had to reduce to a minimum if we were to isolate the effects of the variations to be introduced on the charts themselves. The departure from normal practice allowed us to answer questions about the power of the charts themselves. Were they able to attract children to look at them? Were they able to lure children into studying them?

Tests were devised to find out what children had learned from the posters in just under a fortnight. Three variations in presentation were used. For the first week, one set of posters had ten numbered statements superimposed, a second set had blank pieces of paper, the third had questions, questions that the subsequent statements would answer. For the next three days all posters carried the ten statements. The double statement variant had no pretensions to be curiosity arousing, the other two did. The blank spaces should have aroused a general curiosity, but in the absence of any structure, this might well have dissipated. The questions should have aroused curiosity specific to the topics mentioned in them. The questions should have provided a framework of knowledge with explicit gaps in it. This form of presentation should therefore have been most likely to arouse and maintain curiosity specific to the problems posed and this in turn should have led to greater learning when the answers were provided. The test questions eventually set required the ten statements as answers.

Method.

Design. Three comparable classes of eight and nine year olds in council estate schools were used. Each school displayed the three posters at a set height in a left to right set sequence at the rear of the classroom. Each poster appeared in three different forms for the first week (ten statements, ten questions, ten blank slips), each classroom having one of each. For the second week, all posters contained ten statements. After school on the Wednesday the posters were removed, and the children were given a test of three sets of ten items each of which covered the sets of ten facts displayed. While this design enabled us to extract variance associated with the form of presentation of the facts, it did not allow any isolation of other factors, e.g. sequence of display versus final test order.

Subjects. The subjects were the children of each class present on the day of testing. Children who had been absent for several days of the preceding fortnight would have been eliminated had they existed.

Materials. The three posters were:

1. Milk through the Ages and in Modern Times, referred to hence as 'Cows and Milk'.
2. How Cream is made; How Butter is made.
3. The Story of cheese.

The first had eight main drawings, the second five for each topic and the third nine. Only one set of the added statements and questions is shown below:

Cows and Milk.

Questions	Statements
1. What were the Aurochs?	1. The Aurochs were the first wild cattle.
2. How do we know what cattle used to look like long ago?	2. There are pictures of the cattle of long ago on old pieces of pottery and metal that have been dug up.
3. What is the name of a breed of cattle that gives us meat as well as milk?	3. The South Devon is a breed of cattle that gives us meat as well as milk.
4. What is the name of a breed of cattle that is kept only for its milk?	4. The Ayrshire is a breed of cattle that is kept only for its milk.
5. How often does a cow get milked?	5. A cow usually gets milked twice a day.
6. Why do they cool down the milk?	6. New milk is warm. They cool it down to stop it going sour.
7. How much milk do most churns hold?	7. Most churns hold 80 pints of milk.That is 10 gallons.
8. What does "pasteurising" mean?	8. Pasteurising is a way of heating milk to kill off germs.
9. What does the law say about bottle tops?	9. The law says that bottle tops must fit tightly.
10. About how much money does a glass milk bottle cost the dairy?	10. One glass bottle costs the dairy about five old pence. That is two new pence.

All questions and statements had a pictorial or written referent on the posters.

There were two sections to the post-test, a practice page and a main test. Both had three types of items. The first three on the practice page and six on the main test required gaps in statements to be filled, the next two were one-from-four multiple-choice questions, and the last two were open 'wh' questions to which specific answers could be given. The practice page and the set for Cows and Milk are given in the Appendix.

Instructions and Procedure. The wall-charts were put up on the Monday morning before [illegible] children arrived. The teachers did not mention them, but answered any questions children asked about them. She was to be natural, but passive. On the following Monday the new slips of paper were added or substituted on to the posters. Posters were removed Wednesday night and the post-test given on the morning of the Thursday. The instructions for this were:

Instructions to Teachers - The Test The test is in two parts: (i) The Practice Page, (ii) The Main Test. It seems to be a good idea to give the practice page before morning playtime and the main test immediately after playtime if that is possible.

(i) The Administration of the Practice Page. If possible, the children should be sitting in positions where they cannot easily see other children's answers. Each child is given a copy of the practice page. He is told to put his name at the top where it says NAME but not to write anything else yet. During the administration of the practice page, the teacher will be asking various children what they have written down. The children chosen should represent different ability levels, so that the teacher has an idea how most of the class is coping. Hopefully they will give different answers so that the teacher can make it clear that two different answers may both be right. If there are wrong answers, she can show why they are wrong. If they all have written the same, she should ask if anyone has a different answer. If not, she can suggest an equally possible correct choice. The teacher says:

> 'Later on today I shall be giving you some more pieces of paper and you can show what you know about cows, milk, cream,butter and cheese. I haven't asked you to learn about it so don't worry if you don't think you know anything about these things. Just try your best to show clearly anything you do know. First of all we shall have some practice. There are three different sorts of things for you to do. I don't think you will think they are very hard. Don't worry too much about getting exactly the right spellings. One of these things is filling in blank spaces with some words that fit. You can see some of these sentences in front of you. They have blank spaces and a line underneath each blank space. In a moment you can try and fill in these blank space. Sometimes just one word will be enough; sometimes you will need more than one word. I am going to copy the first one on the board'.

(She does so, blank space and line included.)

> 'Now, on the page in front of you, you can write what you think would go well in the blank space, but, first of all I will read it to you, "The place where cows are kept is called a blank." Now, everybody try and write something in the blank space. Do it on your own. Don't look to see what other people have put'.

(The teacher asks about five representative children what they have written, stressing that more than one answer could be right, e.g. field, shed, farm, etc. She then fills the blank space in the example on the board with the word/s of her own choice.)

'Now let's do the second one. I shall not write it on the board this time. I'll read it out and you follow, "Cows BLANK to the milking shed to be milked." You fill in the blank space.'

(The teacher asks about five children what they have written. She shows how 'go' and 'are taken' for instance, involving a different number of words, can both be right choices.)

'Now the third one, and this is a bit harder, "Cheese BLANK milk". This certainly needs more than one word.'

(The teacher asks about five children what they have written. If some children fail to write anything it does not matter as long as there are not too many, e.g. if a quarter of the class or more, the teacher should spend some time explaining why some of the right answers are right, and the wrong ones wrong.)

'Let's go on to some different ones now. This time there are four sets of words to fill the blank space and you have to decide which is the best choice. I will write the first one on the board.'

(The teacher copies out the first example with all four possible choices.)

'As I read this one out, you think which is the best choice out of these four. (She points to them.) Put a little tick by the one you choose.

She reads out,

'A big machine called a gallon or a churn or a drum or a tank turns round and round and makes butter. Have you each put a tick? Right, now put lines through each of the other choices so that you choice is the only one that is not crossed out. Put your pencils down. I am going to do it on the board. I think that the best word is 'churn', so I put a tick beside it. Now I cross out all the others.

(A horizontal line is put through each of the other possible choices.) A 'churn' is the only set of words which is not crossed out and it has a tick beside it. Let's do the next one. I shall not put this one on the board.)

(The teacher reads it out. The children put their ticks and cross out alternatives. The teacher checks that they have all followed the proper procedure. She then asks about five children what they have chosen. Hopefully they will mostly have chosen 'to eat'. The teacher says that she thinks that is the best choice.)

'The next thing is easy. Just write down answers to these questions. I'll write the first one on the board. (She then reads it out.) Put your answer underneath the question. (Minimal content, e.g. -'a milkman' is acceptable unless there is some firm classroom rule that all answers must be 'complete sentences'.)

Let's see what some of you have written. (About five children are asked.) I shall write my answer up - 'A milkman'. Now the next one.'

(The teacher reads the next question out. The children write their answers if they can think of one. The teacher asks about five children what they have put. The children hand in their example sheets.)

The Administration of the Main Test.

The examples remain on the board. Each child has a copy of the main test format. They are not told it is 'a test'. The children are told to write their names on the front page where it says NAME. The teacher says,

'Now you can see if you know any of these things about cows, milk, cream,butter and cheese. Don't worry if you don't. Think for yourselves and don't look to see what other people have done.'

The teacher then simply reads aloud through the complete set of items, one at a time, leaving time after each for the children to make their responses before proceeding to the next item. This time she does not of course write any items on the board or ask for any oral accounts of responses.

Treatment of Results.

There was one scoring problem which was whether or not to credit children with answers which were correct, but different from those on the charts. The first impulse was to allow only the answers actually displayed, but since children just might have been inspired to do a little research and find out other correct answers, we scored any right answer as correct. This meant that past knowledge and intelligent guessing may have boosted scores as well as any research inspired by the posters.

No statistical tests needed to be applied to the data.

Results and Discussion.

As Table 21 shows, the posters did not function to attract much attention or learning. The teachers reported that the vast majority of the children paid no attention to the original or modified posters. Over the whole pupil population the average number of correct answers was four out of a possible thirty per child. With six multiple choice questions and a measure of previous knowledge this does not represent an orgy of learning.

The data show what looks to be a strong order effect, either from testing or from the left-right sequence of the poster array. If the figures of the second and third rows are boosted proportionately within groups to remove this effect, then it becomes easier to see whether or not forms of presentation had any effect. As Table 21 shows, there is no evidence that either questions or blanks acted as differentiating spurs to learning.

TABLE 21. Total Number and Means of Items Correct for Tests of Knowledge of Wall-charts in Three Schools.

Scores	School			
	1	2	3	Means
Total Scores				
First Test: Milk & Cows	96	58	62	72.0
Second Test: Cream & Butter	44	25	29	32.7
Third Test: Cheese	21	10	6	12.3
Possible scores per test	330	290	250	290
Mean Scores (max.10)				
First test	2.91	2.00	2.48	2.50
Second test	1.33	0.86	1.16	1.12
Third test	0.63	0.40	0.24	0.42
Mean Scores for Different Forms of Display (max.10)				
Statements (S) → Statements	0.63	0.86	2.48	1.32
Blanks (B) → Statements	2.91	0.40	1.16	1.39
Questions (Q) → Statements	1.33	2.00	0.24	1.19
Prorated Scores				
Statements (S) → Statements	3.68	1.89	2.48	3.97
Blanks (B) → Statements	2.91	2.34	2.55	3.47
Questions (Q) → Statements	2.93	2.00	1.49	3.57
N	33	29	25	

The only other result worth noting is the general absence of 'Don't knows' and 'No answers'. Fewer than seven of the twenty nine questions were so treated. This means that over twenty questions were answered, but answered wrongly, and often foolishly. There would appear to be a difference between schools, one school being particularly prone to 'have a go'.

Discussion.

While we realised that the decision not to integrate the charts into lessons might limit their power, we did not anticipate their almost total impotence to facilitate learning. The teachers were not overly surprised. Before we make comment about that result, we need to make note of the very high incidence of wrong answers. Such behaviour became a minor theme of an earlier report (Robinson, 1974). There it arose in the guise of guesses, the convergent one-answer-only mentality (but see chapter 4), the desire to get items right even when this involved cheating (Robinson chapter 7), the distress at only knowing how to find out (*ibid., loc.cit.*) without knowing the actual answer. There is something strange about an educational system that encourages children to produce as much uninformative nonsense as they did here. They must have known that most of their answers were wrong? That they should behave in such a way is consistent with the comments about the prevalence of response-centred learning made in chapter

We are wholly unable to answer the original questions posed about the effectiveness of questions as opposed to blanks and statements as facilitators of learning. All were equally irrelevant!

To attribute the general impotence to the wall-charts could be misleading. As far as we could see they were good charts. We could attribute the failure to the naivety of the experimenters. An unrepresentative sample of casually questioned teachers gave replies consistent with this interpretation. Since we are stubborn however, we still find it unpleasantly surprising that children can be so unobservant or so uninterested in their surroundings. Many of the classrooms one enters show evidence of much preparation of materials by teachers. Alas, if children are not encouraged to keep their eyes and ears open, such efforts may yield but scant reward. The headmaster of one of the schools remarked how little his children noticed. One example he mentioned was that they had said there were no flowers around their area. He took them out into their playing fields and found twenty in ten minutes. Another teacher showed us five leaves of assorted trees that her children saw as alike.

Whether the capacity or enthusiasm for noticing differences and similarities in the environment has to be encouraged or whether in these children it has been discouraged, the problem remains the same. The absence of any response to wall-charts precludes the possibility of investigating any differential response to varied forms of presentation.

Where Should the Questions Go?

Introduction.

The investigation of the role that questions might play in attracting children to posters and directing their thinking was not a success, but it served as a vehicle for illustrating that decisions about the linguistic structure of meaningful verbal materials need validation against the performance of the learners. Any sentence in English can take only one of four forms: declarative, interrogative, imperative or vocative. These are roughly correlated with the four functions of stating, questioning, commanding and exclaiming. We shall ignore the latter two and look at declarative and interrogative structures in texts where they are closely correlated with stating and questioning. Any prose passage of more than one sentence can be made up of a large array of combinations of declaratives and interrogatives, and it is the relevance of various ways of mixing these to the amount of learning in which we are interested. The only variation examined is in sequence. We can put all the questions first followed by all the statements. We can put the statements first with the questions after. We can locate each question before its answering statement. Does it matter which we do?

Interest in this area is of very recent origin, the first attempt to look at the problem empirically being reported in 1965. Ultimately we shall have to answer questions about the ratio of questions to statements optimal for learning. We shall need to know about the advantages and disadvantages of open-ended and closed Yes/No questions, about general and specific questions, about the consequences of providing questions rather than letting learners generate their own. We shall want to know whether questions expressed as interrogatives are more or less effective than other transformations of the grammatical or semantic structure.

But to begin at the beginning and with the specific rather than the general. All teaching materials with verbally expressed information make certain assumptions about the role of questions in learning. One traditional assumption is that questions should appear as exercises at the end of material to be learned. Another one is that intermittent questions in the text itself are useful. We wished to see whether either or both were true.

To this end we constructed three prose passages of comparable length and difficulty about three different, but similar, topics. With some fifteen declarative sentences in each, we could preserve some measure of naturalness when we inserted five questions into each passage. This also allowed the asking of questions about other sentences in the passage. With the five questions coming before, within, or after the passage, we could give children a subsequent test on information already associated with a question (explicit questions) and on information not so associated (implicit questions.)

Method

Design. Each of three comparable groups of children was exposed on three successive days to three prose passages about three different topics. Each passage contained fifteen sentences. Each passage had three forms, one in which it was preceded by five questions, one in which it was followed by the same five questions and one in which the five questions were embedded in the text immediately before their answers. Each class experienced topics in the same order and position but in different forms. This design confounds position with both school and topic, but separates out the influence of the different locations of the questions. Since the schools were believed to be comparable, we confounded school and position, so that we could isolate any effects due to topic. The measure of knowledge acquired was based on scores in a ten item test made up of the five previously encountered questions (explicit) randomly mixed with five new questions (implicit). All questions occurred in the same order as the answers were given in the prose.

Subjects: All the eight and nine year old children from three comparable council estate middle schools took part.

Materials. Both texts and questions were carefully scrutinised by teachers and ourselves. Attempts were made to ensure that the basic lexical units and sentence structure were within the grasp of the children. Differences between passages were eliminated in terms of length (all between 180 - 190 words long) and sentence structure, we hoped they were comparable in other respects. Some pilot tests suggested they were, in so far as learning scores were similar. We did not check that the explicit questions were of the same order of difficulty as the implicit questions, although we endeavoured to make them so by dividing the ten questions randomly into two sets.

Only the texts with questions embedded in them are shown here. Answers to explicit questions follow them; answers to implicit questions are underlined here but were not in the texts presented.

The Moon.

The Moon and our Earth are both round balls in space.
How far apart are the moon and our Earth? They are 240,000 miles apart from one another.
The moon keeps going round the Earth in circles.
How long does it take the moon to travel once round the Earth? It takes one month to travel once round the Earth.
Unlike the sun, the moon does not make any light of its own. It still shines though, and this is because light from the sun falls on the moon and the

moon reflects this light. In the same way, some objects we see every day, like metal spoons and polished wooden tables, shine because they are reflecting light. The moon is smaller than the Earth. About how big is the moon? Its whole surface is only about the size of Africa. There is no air, water, rain or wind on the moon, so it is a dead and silent world. It gets both very hot and very cold on the moon. How hot does the moon get in daytime? In a moon daytime, the ground gets as hot as boiling water; at night time it becomes freezing cold.

Earth is not the only planet which has a moon. What is the name of another planet that has moons?

The planet Jupiter has not just one moon but twelve of them.

The Planets.

Planets are all round balls in space. Just as moons move in circles round planets, planets go in circles round stars. Our sun is really a star. How many planets are there round our sun? It has nine planets circling round it. Some planets stay nearer to the sun than others, but they all keep circling round in their their own separate paths. Which planet is closest to the sun? The planet which is closest to the sun is called Mercury. How long does it take the closest planet to make a circle round the sun? Mercury takes only three months to make one circle round the sun. Our planet Earth takes one year. Pluto is the planet which is furthest away from the sun and it takes 250 years to make a circle round the sun.

The two planets which are nearest to Earth are Mars and Venus, one on one side and one on the other. Which side of Earth is Venus on? Venus is on the side nearer the sun and Mars on the side further away from the sun.

Venus is about the same size as Earth. How big is Mars? Mars is smaller; it is about half as big as Earth. The sandy deserts which cover Mars make that planet an orange-red colour.

The Stars.

Like planets and moons, stars are ball shaped. Stars are not solid, though. What are stars made of? They are fiery balls of gas.
Which is the nearest star to our Earth? The nearest star to our Earth is the sun. The sun is not really bigger and brighter than all the other stars. It just looks as though it is because things that are much closer always look bigger. When can we see the Milky Way in the sky? On clear nights, in summer and autumn, we can see the Milky Way in the sky. It is made up of millions of stars and other space objects. There are so many of them that we do not see the spaces in between. That is why the Milky Way looks like a misty white streak in the sky.
What is an enormous group of stars called? An enormous group of stars is called a galaxy. Is the Milky Way one of these groups of stars? The Milky Way is just part of a galaxy. It is part of the same galaxy that the sun, moon, our Earth and the other planets belong to. Because we are inside our galaxy and part of it, we can not see its shape. If we could get a long way outside our galaxy, we would see that it is shaped like a great big wheel.

Tests.

Each test sheet had a space for the child's name, the appropriate title and was headed with the instruction: 'Try to answer these questions. Put your answer on the line underneath each one.' Space was left under each question for its answer. Items marked (S) are questions secondary to those already encountered before, after or within the text.

The Moon.

1. In what way are our Earth and the Moon like each other? (S)
2. How far apart are the Moon and our Earth?
3. How long does it take the moon to travel once round the Earth?
4. Why does the Moon shine? (S)
5. About how big is the Moon?
6. What is it like on the Moon? (S)
7. How hot does the Moon get in daytime?
8. How hot is the moon at night time? (S)
9. What is the name of another planet that has moons?
10. How many moons does that planet have? (S)

The Planets.

1. What do planets do? (S)
2. How many planets are there round our sun?
3. Which planet is closest to the sun?
4. How long does it take the closest planet to make a circle round the sun?
5. Which planet is furthest away from the sun? (S)
6. How long does the furthest planet take to travel round the sun? (S)
7. Which side of Earth is Venus on?
8. How big is Venus? (S)
9. How big is Mars?
10. Why is Mars an orange-red colour? (S)

The Stars.

1. What shape are stars? (S)
2. What are stars made of?
3. Which is the nearest star to our Earth?
4. Why does that star (in no.3) look big? (S)
5. When can we see the Milky Way in the sky?
6. What is the Milky Way made up of?
7. What does the Milky Way look like? (S)
8. What is an enormous group of stars called?

9. Is the Milky Way one of those groups of stars?
10. Why can we not see the shape of our star group? (S)

Each test was accompanied by a large cardboard picture which portrayed the main units and their movements, but had no words.

Instructions and Procedure. One topic was presented on each of three successive days. The information and the five explicit questions were given as the first activity of the day, the retention test of ten questions given at the end of each day. The order of topics was constant: The Moon, The Planets and lastly, the Stars.

Instructions for Topics. To introduce the first task the teacher said:

> 'This week we shall be learning a bit about space. Today we have a passage about the moon, some questions to go with it and a picture to go with it. (The picture was put up, and it was pointed out that the dotted line (ellipse) showed the way the moon moves.) Later on today we shall have some more questions just to see what we have remembered from this morning. It will be interesting to see.'

The teacher then followed the instructions appropriate to the treatment.

For the second task on the second day the teacher said:

> 'Yesterday we learned a bit about the moon. Today we shall learn about the planets. Our earth is one of the planets in space and there are other ones too. This time we shall be doing things a little bit differently, because we shall be thinking about the question before (after/in the middle of) reading the passage. (As the picture is displayed, again it was pointed out that dotted lines represented orbits and it was added that not all the planets were shown.)
> 'Just like yesterday, we shall have some more questions later on today, just to see what we have remembered.'

Treatment appropriate instructions followed.

For the third and final session the teacher said:

> 'On Wednesday, we learned a bit about planets. Today it is going to be 'stars'. This time we shall be thinking about the questions before (after/in the middle of) reading the passage. (The teacher displays a picture pointing out that it portrays many, many stars.) Later on we shall see what we have remembered.'

Treatment appropriate instructions followed.

Instructions for Treatments. For Questions before Text (Q → T) the teacher handed each child a sheet with five questions on as soon as the topic-specific instructions were completed. The teacher told the children to look at the questions as each one was read twice. Children were to try and think what the answers might be, but they did not have to write anything. They would be reading something in a moment that contained the answers to the questions.

The teacher then read each question twice slowly and pausing after each question to allow the children to think about it. After this, the question sheets were collected, the relevant text distributed and the children told that the text answers the questions, but mentions other things as well.

The passage was then read slowly, but expressively, with the children following it, and then children's copies were collected while the teacher said: 'I expect some of you managed to find the answers to those questions as we read about the moon (planets/stars) and found out other things as well. I wonder how well you will remember it. It shouldn't be too hard should it?'

For Questions after Text (T → Q) similar instructions were given mutatis mutandis. For Questions within Text (Q in T) instructions followed a similar pattern and the procedure was rendered comparable by having each question read twice.

Attempts were made to control for the times children had questions and passages available to them, about two and a half minutes for the actual reading of questions and texts. Success was claimed for this.

Instructions for Knowledge Test. The teacher said:

> 'Let's see how well you have remembered what we learned about this morning. Don't worry if you don't think you can remember anything, because it doesn't matter. It will be interesting to see though, won't it? I shall give each one of you a piece of paper with some questions on it and I'll read them out as you follow. Each of you must try and remember for yourselves, so don't look at what other people have put. Put your name at the top of the page. (Questions handed out and names inserted.) Now we're ready to start. Write your answers just underneath the questions.'

Each question was read aloud twice, more slowly on the second occasion. Time was given for children to write their answers after each question.

Treatment of Results.

It was possible to include thirteen boys in each group, but only a small number of girls, and so the analysis was confined to boys. Sexes were not mixed because any relative superiority of girls or boys would have added unnecessarily to within group variance. When sums of knowledge scores were tabulated for each of the eighteen constituent groups, it was obvious that there was systematic variation, but neither its nature nor significance could be readily spotted with the naked eye. A three factor with two repeated measures analysis of variance (Winer, 1962, p.319 *et seq.*) was used to expose the underlying patterns.

Results.

As Tables 22 and 23 show the strongest effect was with explicit

Questions ($\overline{X}$ = 9.08) being answered more successfully than implicit Questions ($\overline{X}$ = 6.31). This difference of nearly thirty per cent is substantial as well as significant. The significant interactions drawn in Figures 3, 4 and 5 enable the following statements to be made:

(i) The difference between explicit and implicit Questions is most pronounced for the case where the explicit Questions are embedded in the text (difference = 1.33) rather than when they are either before or after (difference = 0.75). Absolutely this looks small, but it translates to a difference of eighteen per cent.

(ii) For the interaction between School and Question Location variations, it is again the Questions embedded in the text which show up differences; School A1 doing better than A3 with A2 trailing.

(iii) The significant three way interaction might be described in more than one set of terms, but the only one that led to a meaningful interpretation would point to the relatively low scores for implicit Questions in the Question after Text condition in School A and in the Questions before Text condition in School C.

Discussion.

Since we have little reason to suspect that there were any differences between the Schools themselves, and we had in fact hoped that they would not emerge as a significant source of variance, we may ask what the Questions after Text condition in School A had in common with the Questions before Text condition in School C. They both were given as the middle of the three tests. In School A2 although the corresponding Within Text question condition shows the more common difference in favour of implicit questions, it is noteworthy that an Intra Text question score for this

TABLE 22. Total Answers Correct for Different Texts for Explicity and Implicitly Answered Questions by School and by Location of Questions.

Text	School									Totals			
	1			2			3						
	Exp	Σ	Imp	Exp	Σ	Imp	Exp	Σ	Imp	Exp	Imp	Grand	Means
Moon	21		40	29		40	27		41	77	121	198	5.08
Planet	37		32	18		31	38		29	93	92	135	4.74
Stars	27		52	25		46	24		43	76	141	217	5.56
Total	85	(209)	124	72	(189)	117	89	(202)	113	246	354	610	
Mean	2.18	(5.36)	3.18	1.85	(4.85)	3.00	2.28	(5.18)	2.90	6.31	9.08		15.39

	Before Text			After Text			Within Text		
		Σ			Σ			Σ	
Moon	21		40	29		40	27		41
Planets	38		29	37		32	18		31
Stars	25		46	24		43	27		52
Total	84	(199)	115	90	(205)	115	72	(196)	124
Mean	2.15	(5.10)	2.95	2.30	(5.26)	2.95	1.85	(5.03)	3.18
N		13			13			13	

Exp refers to answers to questions which have already been met before, after, or within texts. Imp refers to answers to questions where the information has been met, but not focused upon by a question.

TABLE 23. Analysis of Variance of Effects upon Learning of School, Location of Questions and Primariness of question.

Source of Variation	Sum of Squares	df	Mean Square	p
Between subjects	249.20	38		
A (School)	2.64	2	1.32	1
Subjects within Groups	246.56	36	6.85	
Within Subjects	274.34	195		
B(Location of Questions)	0.54	2	.27	
AB	19.20	4	4.80	4.96**
B x Subjects within Groups)	69.60	72	.97	
C (Primary/Secondary Questions)	49.84	1	49.84	37.75***
AC	3.00	2	1.50	1.14
C x Subjects within Groups	47.50	36	1.32	
BC	5.16	2	2.58	3.87*
ABC	31.46	4	7.87	11.80**
BC x Subjects within Groups	48.04	72	.67	

* means p <.05, ** means p < .01, *** means p < .001

group is both lower for School A2 than for the other two schools and lower than A2 scores for the other two treatments.

It is a common effect in studies of both learning and retention to find that beginnings and ends of sets of materials are learned and retained better than those in the middle. If we treat the three tasks as a simple unit then we would expect poorer performance for Questions before Text in School A1, Questions after Text in School A3 and Questions within Text in School A2 which, fortunately, is what is obtained.

Other interpretations are possible. Perhaps the novelty of the first day gave an initial boost in performance, while the children revived their efforts for the third day after noticing their inferior performance on the second day. Perhaps it was raining on the second day. There are many stories that might be woven, and since none can be substantiated, they might as well be ignored.

This leaves two substantive results. The first is that

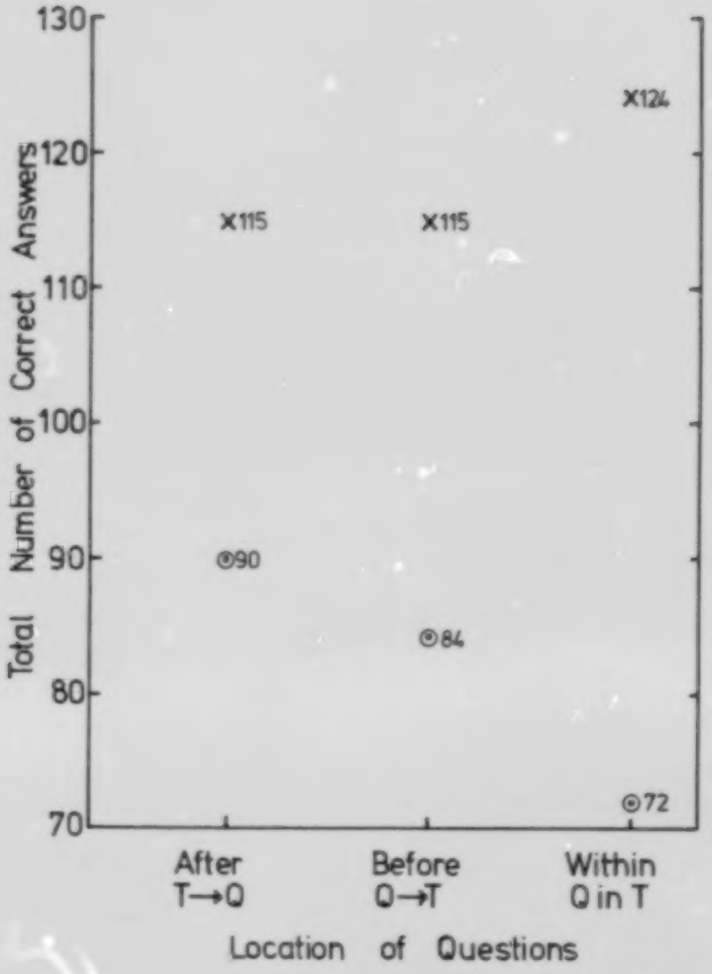


Fig. 3
Correct Answers as a function of the Location of Questions for Explicit and Implicit Questions.

Key: x = Explicit ; ⊙ = Implicit Questions

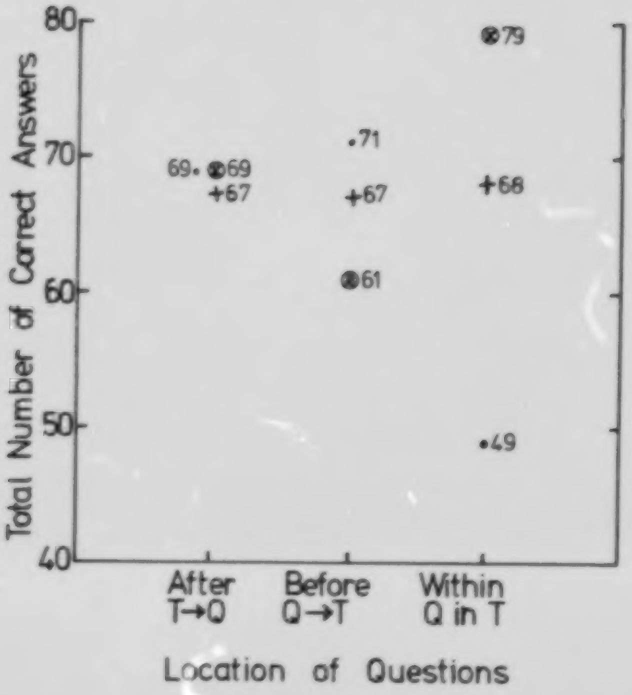


Fig. 4
Correct Answers as a function of the Location of Questions for Three Different Schools.

Key: ⊗ = School A1
• = School A2
+ = School A3

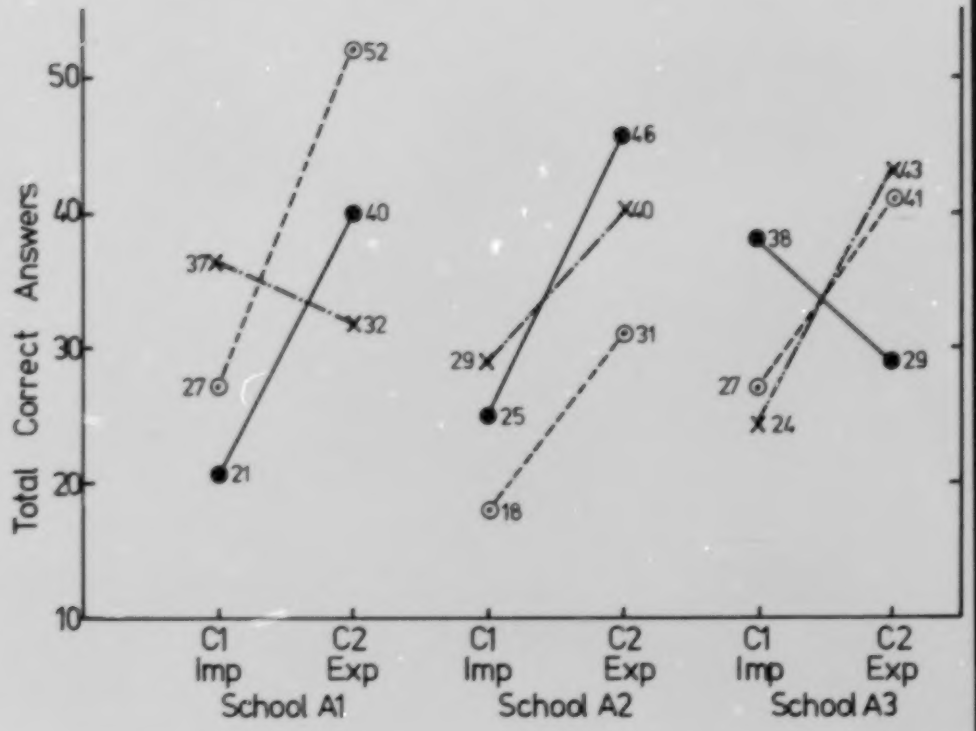


Fig. 5

Correct Answers as a function of School and Explicitness of Questions for the Three Tasks.

Key: C1 = Explicit Questions; C2 = Implicit
●——●= B1 (Moon; 2nd Task in A3)
×-·-×= B2 (Planets; 2nd Task in A1)
⊙----⊙= B3 (Stars; 2nd Task in A2)

implicit Questions were less well answered than explicit Questions, regardless of when the Primary Questions were given. The questions appeared to focus attention successfully, but a price was paid in that other material was less well learned. The second is that this effect was most pronounced for the condition where the questions were embedded within the text. We might wish to generalise this result to questions embedded within any extended monologue. We frequently employ questions in our teaching monologues to excite curiosity or to focus attention on important points. That the second can be successful is consistent with our data. We cannot answer the first because each of our conditions employed the same number of questions, but since the scores for the Questions within Text condition were certainly no higher than the other two for the implicit Questions and this condition could be argued to be most like the natural lecture, we cannot produce any evidence to suggest that their inclusion does excite curiosity generally.

These results are not inconsistent with those reported elsewhere. Prosser (1974) has reviewed and added to studies examining the consequences of posing questions before and after prose material that is to be learned. This summary of results includes the following conclusions:

1. Subjects did in fact learn more from written passages if they were periodically tested on the material read.
2. Post-text questions were more likely than Pre-text questions to facilitate learning, especially of answers to secondary* questions.
3. Subjects instructed to read and study carefully or given extended time, answered secondary questions as well or better than those given questions with the texts.
4. Pre-text questions appeared to lead to pro-active interference, probably through differentially focussing and rehearsal of answers to them.

* Prosser follows the terminology of Rothkopf and of Frase in which 'secondary' equals 'implicit' and 'primary' equals 'explicit'.

5. This effect could be sustained over a seven day period.
6. It could be depressed by exploiting external incentives for learning (viz. money).

Prosser's own results would require some modification to the generality of these conclusions, but the substance remains unaltered. What our experiment has probably shown is that interference is even greater for questions within texts than it is for those given before.

Comment.

We should take due note of the obvious role of questions as a device for checking learning and record that a learner's prior knowledge that questions will occur later generally benefits his learning.

Their role as instigators of learning is in far more doubt. The model of man as an acquirer of knowledge (chapter 1, Fig. 1) contained the chain: Stimuli (complex, novel, surprising, incongruous, ambiguous) ⟶ Uncertainty (Curiosity) ⟶ Attention ⟶ Epistemic behaviours (Questioning). We added that epistemic behaviours led to learning when the stimuli became assimilable. If we extract the sequence, Curiosity ⟶ Questions ⟶ Learning, what the results of the two investigations reported here show is that there is no re-entry of the arrow from Questions to Curiosity; no feed-back loop that allows questions provided from outside to arouse curiosity, make the questions one's own and then learn. Expressed differently, intervention at the point of Questions is ineffectual. Only the provision of the appropriate stimuli will trigger off the sequence. This is not to say that questions might not themselves act as such triggers on occasions but only that they have no privileged status as arousers of curiosity; their substance may arouse, their form does not.

This view is consistent with the explanation given of the development of children's rate of questioning (chapter 3). Rates of questioning in children were positively associated with general knowledge offered in answers, and both were associated with those features of answering, correctional, and rewarding behaviours of mothers that would make sense to a Piagetian, a Berlyne or a Mr. Everyman. The mother's attempts to arouse and direct interest with questions did not relate to the child's questioning behaviour. We concluded there that our data could be squeezed into the proverb 'You can lead a horse to water, but you cannot make him drink.' Questions do not help to lead him. We have to start further back and to find out more about this we need to expand the types of investigation already discussed in chapter 5.

APPENDIX

NAME:

PRACTICE PAGE

On some different pages there are three different sorts of things for you to do to show what you know about cows, milk, cream, butter and cheese.

On this page there are some for you to practise.

I. Fill in the blank spaces in these sentences with some words which you think will fit. Sometimes you only need one word. Sometimes you need more than one word.

1. The place where cows are kept is called a........
2. Cows............to the milking shed to be milked.
3. Cheese.............milk.

II. Choose which set of words is the best one. Put a tick by the one you think is the best one. Then put lines right through all the other ones.

1. A big machine called
   - a gallon
   - a churn
   - a drum
   - a tank

   turns round and round and makes butter.

2. Cheese is good
   - to burn
   - to make things with
   - to keep cool
   - to eat

III. Answer these questions. Write the answers underneath the questions.

1. What is a person called who brings milk to people's homes every morning?
2. Why do people say that children should drink milk?

COWS AND MILK

I. Fill in the blank spaces in these sentences with some words which you think will fit. Sometimes you only need one word. Sometimes you need more that one word.

1. The Aurochs were the........................
2. Old pieces of....... ....show us what the cattle of long ago looked like.
3. The................. is a breed of cattle that gives us meat as well as milk.
4. The.................is a breed of cattle that is kept only for its milk.
5. "Pasteurising" means...........the milk in a special way. The reasons they pasteurise milk is to ....
6. The price that the dairy has to pay for one milk bottle is............

II. Choose which set of words or which number is the best one. Put a tick by the one you think is the best one. Then put lines right through all the other ones.

1. You can get
   10
   80
   8
   18
   pints of milk in a milk churn.
2. A cow usually gets milked
   once a day
   twice a day
   twice a week
   four times a week

III. Answer these questions. Put the answers underneath the questions.

1. Why does the milk have to be cooled after it comes out of the cow?
2. What does the law say about bottle tops?

CHAPTER 8.

A BRIEF EDUCATION IN QUESTION-ANSWER LINKAGE.

Introduction.

An investigation reported in chapter 3 (Rackstraw, 1970)(p.78) provided evidence that a substantial number of nine year old children have not grasped certain general rules about what makes certain statements more suitable than others as answers to particular questions. Can these children be readily taught about this?

A direct approach was made to change the level of performance of children set to recognise appropriate answers to questions. We decided to use a hand puppet. The children were asked which animal they thought was the cleverest. They were able to agree, and a papier mache monkey was made for manipulation by the class teacher.* The monkey was to be asked questions and would then give answers. Sometimes his answers would be grammatically appropriate and informative, sometimes not. Every statement made by the monkey was true. It was not the truth, but the relevance and informativeness that were to be in doubt. The monkey was represented as really knowing the differences between more appropriate and less appropriate answering, but also as being prone to try to trick the children with some of his answers. All interaction was oral. The activities took place in normal classroom conditions. The children in the class were to object if they thought the answer the monkey gave was inadequate in some way. They would then be expected to make more explicit why they thought the answer inadequate. The monkey would eventually give an appropriate informative answer. By using a puppet rather than the class teacher to give answers we hoped to depersonalize the potential competition between pupils and teacher. We hoped they might be willing to pit their wits against a clever but humorous monkey puppet.

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* Footnote: We must make special mention of Mrs. Rita Timlin who not only played the role of puppeteer, but conducted the whole experimental intervention with full efficiency and enthusiasm.

Method.

Design. Experimental and control groups were both tested before and after the experimental group was exposed to a treatment designed to improve discernment about the appropriateness of various statements as answers to questions. The control group received no special treatment.

Subjects. The subjects were two classes of eight and nine year old children from two local authority schools on neighbouring urban area council estates. One class was the experimental group, the other the control group. The numbers of subjects present in the different groups for two tests (before and after the experimental manipulation) are shown in Table 24. All children present in class on the days of the tests took part.

TABLE 24. Number of Subjects taking part by Sex and Experimental Condition for Pre-test and Post-test.

		Test		
Group		Pre-test	Post-test	Both tests
Experimental	Boys	21	18	18
	Girls	17	14	13
	Total	38	32	31
Control	Boys	15	16	13
	Girls	16	13	14
	Total	31	29	27

Materials. The pre-test and post-test each consisted of three-page forms containing twenty test items preceded by two examples. An item was a question followed by two possible answers of which the subjects were to select one to match the question. Both answers were always true, but one was less suitable as an answer to the particular question it followed. Below the answers was a half inch square for the subjects to write their choice (1 or 2). 'More suitable' and 'less suitable' answers were randomly allotted to first and second positions, except where pairs of items were very similar to one another. For these, positions were reversed.

In the post-test all positions were reversed relative to the pre-test.

Eight pre-test items were repeated in the post-test, twelve were different. The items repeated were mainly those on which a high proportion of 'wrong' choices had been made by both experimental and control groups. The pre-test items for which the 'more suitable' answers were virtually universally chosen were not repeated. New items in the post-test were intended to show whether improvement in performance had generalised.

The items could be grouped into four categories. In each example that follows, the first answer is 'correct'.

Grammatical Appropriateness Items.

There were sixteen of these items in the pre-test (A, B, D, E, F, I, J, K, L, N, O, P, Q, R, S & T) and twelve in the post-test (A, B, C, D, G, I, L, M, P, R, S, T) of which only four were repetitions (B, P, R, T.) For these items the correct choices answered the questions, while the incorrect ones had strong lexical or semantic associations, but in fact answered other questions. In most cases a different 'wh' word would have had to have been used to evoke the incorrect choice. There was no systematic variation of the types of incorrectness.

e.g. Q. What is frogspawn?

A1. A mass of jelly containing frogs' eggs.

A2. The jelly protects and feeds the baby tadpoles.

Definition Items.

There were two items in this set in the pre-test (C,M) and four in the post-test (E, F, K, N) of which F and N were in the pre-test. These items asked for a definition of some set of objects in the form 'What is a....?' The correct choice offered an appropriate definition, while the incorrect choice mentioned a specific member or members of the set and would have been an appropriate answer either to the question 'What is a ....?' where the focus was on that example as a member of a set or to a request for examples of the superordinate set.

e.g. Q. What is an insect?

A1. An insect is a small animal with six legs and three parts to its body.

A2. An ant is an insect and so is a bee and all sorts of beetles.

Part-Whole Items.

Only one item in the pre-test was of this kind (H). It was repeated in the post-test (O), and another was added (Q). In these, the question was concerned with some attribute of a whole set of objects and the correct choice was relevant to the greater part of the set or its average member, while the incorrect choice gave information only for a limited subset of the set. The question for the incorrect choice would have taken the same form, but its focus would have been on the subset.

Object-centred - Human-centred Items.

The one item of this kind in the pre-test (G) was repeated in the post-test (J) and a second one added (H). For these 'What is X for?' questions one choice related the function to the object of which X was an attribute, the other mentioned the use of X to man. In chapter 6 one of us was shown to be wrong with his obsessionally objective view of the world when both children and adults pronounced that 'What are rivers for?' was a perfectly sensible question. Here we avoid saying that the human-centred answers are wrong, but note that we would expect the developmental trend to be away from these.

e.g. Q. What are flowers on a plant for?

A1. The flower makes seeds from which new plants can grow.

A2. The flower is the beautiful part of the flower which we can pick.

The full sets of questions and answers are given in the Appendix.

Materials for the Experimental Intervention. The children in the experimental group spent enough time in interaction with the monkey puppet every school day for three weeks for him to answer upwards of ten questions a day. The monkey was asked questions and gave answers, some of which were unsuitable in one of the four ways mentioned above.

For the first four days all ten questions and answers were supplied by the designers of the experiment. For all but one of the remaining days the designers supplied five questions and answers, while the children asked an average of eight questions per day. On one day the children asked all the questions. The teacher thought up suitably appropriate or inappropriate answers to these. Altogether the children had practice with just under one hundred questions and answers, of which over half were answered wrongly in the first instance by the monkey. All question types were included in the practice materials. These sessions did not include any questions from either the Pre- or Post-tests.

Procedure.

The pre-test was administered to both experimental and control groups on a Tuesday morning in class time during the second half of the spring term. Three weeks and one day later the subjects were given the post-test. For both tests, subjects were told to fill in the forms for themselves without the help of anyone else. The instructions for the two tests differed slightly from one another in wording.

The Pre-Test.

As the teacher gave out the forms, she told the children that they contained questions and answers and that she would read each question and answer out to them. The children were told to write their names at the tops of their forms. When each child had a form, the teacher gave the remainder of the instructions, which were the same for both the pre-test and the post-test.

The Post-Test.

Before giving out the forms, the teacher said,

'Some of you will remember something we did a few weeks ago. We had a list of questions which each had two answers. As I read each one out to you, you followed and had to decide which answers you thought were best. We are going to do the same thing again today. You may even recognize some of the questions because you had them last time. There will be new ones as well though.'

The forms were then given out and the children wrote their names at the tops of their forms. The teacher said, 'Some of you were away and some of you may have forgotten what to do, so I will remind you and we can do two examples together.'

The Pre-test and Post-test.

The teacher said,

'Different people often answer the same question in different ways, and sometimes we think some answers are better than others. Do you see the little boxes on the paper in front of you? These are for you to put a '1' or '2', in depending whether you like answer '1' or answer '2' to each question. Both A2 and A2 are true, but sometimes A1 answers the question better and sometimes A2 does. Let's all do the ones at the top under where it says EXAMPLE. The first question is (Teacher read out the first example question) and here are two answers. (Teacher read out the two answers of the first example.) If you think '1', that is the first one, is a better answer to (first example question) than the second one, put a '1' in the box, if you think the second one '2' is better than the first one, put a '2' in the box. (Pause) Has everybody got something in the box?

The teacher checked up that everybody had written something in the box and added,

'Is there anybody who really cannot decide? Try and decide which one is better. If you really cannot decide put a '0' in the box. Let's do the second example now. (Teacher read out the second example question.) Here are two answers. (Teacher read out the two answers of the second example.) Both these things are true. Which do you think is a better answer to (first example question?)'

The teacher checked that everybody had something written in the box, '1', '2' or '0'. 'Let's do the rest of them now.' The teacher read each item, i.e. each question and both answers and then left a few seconds for the children to decide on their choice before moving on to the next one.

Procedure for the use of the puppet.

The Introduction.

The monkey puppet was introduced to the class. The class called him Mr. Bloggs. The children were told that he liked to answer questions but he also liked to play tricks.

> 'Although all the things he says are true, he doesn't always answer questions properly. Sometimes he seems to be answering a different question altogether and sometimes he just doesn't really tell you anything when he answers the question. What you have to do is to see if he answers my questions properly or not. Then, if you think very hard, you may be able to think what he could have said to answer the question properly. If you think very hard again, you may be able to think what question he was answering. Mr. Bloggs will be with us for a few days yet. I expect we shall soon learn to spot his tricks. Of course, he doesn't always try to trick us by not giving proper answers. Sometimes he answers beautifully because he is really a very clever monkey. I shall ask him a few questions now. If you think he is not answering properly just put your hand up and I shall ask you what you think is wrong.'

The Normal Daily Procedure.

The teacher would go through the list of the day's questions and answers. After each question the teacher asked several children who had their hands up, what they thought was wrong, what the monkey could have said if he was really answering properly, and, if the answer was inappropriate rather than uninformative, what question he was really answering. At the end of the discussion about each question, the teacher told Mr. Bloggs that the children were not satisfied and he gave a proper answer. If the monkey answered properly first time, the children could still discuss if they wanted to. The teacher was asked to attempt to get the children to understand that all the monkey's statements were true in themselves.

Treatment of Results.

Initial tabulations of the raw data gave no evidence of sex differences, and so the results are not reported separately for boys and girls.

With both pre-and post-test measures for both experimental and control groups, two main types of comparison were possible. Post-test scores of experimental and control groups could be contrasted and any differences attributed to training, provided that pre-test scores showed an initial similarity across the groups. All children were included in these analyses. It was also possible to look directly at changes by examining pre- and post-test scores of the experimental group and to compare them with changes in the control group. Only subjects present on both occasions could be included in these comparisons.

All contrasts could be made for the items as a whole, categories of items, repeated and new items, and individual items.

Results.

Pre-test scores of Experimental and Control Groups. The results are summarized in Tables 25 and 26. Overall the children achieved a success rate of sixty six per cent. Eight items, all in the Appropriateness category (A, B, E, F, O, P, S & T), were answered correctly by over seventy per cent of the children. These gave little room for showing significant improvements resultant from training and were therefore dropped from the Post-test. Five of the remaining seven Appropriateness items (D, Q, O, N & R) gave significant differences in favour of the Experimental Group. While the immediate temptation was to drop all these from the Post-test, two were retained (D & Q) to check that the high level of success in the Experimental group was not an unstable artefact.

TABLE 25. Mean Pre-Test Scores of Correct Answers for Experimental and Control Groups.

Item		Subject Group				
Category	No.	Experimental	Control	U or χ^2	z	p
Appropriateness	16	12.21	10.68	380.50	2.25	.02
Definition	2	0.78	0.84	1.60	-	-
Part-whole	1	0.36	0.52	1.00	-	-
Object-centred	1	0.47	0.35	0.56	-	-
Total	20	13.84	12.38	486.50	2.21	.03
Items retained for Post-Test	8	3.95	3.42	497.00	1.12	-
N		38	31			

The remaining two Appropriateness items (I & L) and all four in the other categories had error rates exceeding fifty per cent and did not favour either group. These were retained for the Post-test, and it can be seen from Table 29 that the initial differences between the groups was neutralized by the pruning.

Post-test scores of Experimental and Control groups. The results are summarized in Tables 27 and 28. Overall the Experimental group made significantly higher scores than the Control group. This was true for Appropriateness, Part-whole and object-centred versus Human-centred items. It was not true for Definitions; although there were three significant differences, one favoured

TABLE 26. Distribution of Correct and Incorrect Choices of Answer for the Experimental and Control Groups on the Pre-test.

Questions	Choices of Answer									
	Experimental Group N = 38				Control Group N = 31					
	✓	X	?	%Right	✓	X	?	%Right	χ^2	p
Appropriateness Items										
•D When do seals leave the sea?	29	7	2	76.32	17	14	0	54.84	3.99	.05
•I What is frogspawn?	14	23	1	36.84	12	19	0	38.71	-	
•L What part of the potato plant is the potato?	14	21	3	36.84	9	21	1	29.03	-	
•Q How is the metal steel made?	31	5	2	81.58	18	12	1	58.06	4.54	.05
A What causes volcanoes?	32	5	1	84.21	25	5	1	80.65	-	
B Why is it wrong to spoil people's things?	28	8	2	73.68	27	3	1	87.10	-	
E What is the difference between a monkey and a gorilla?	30	6	2	78.95	24	6	1	77.42	-	
F When do we see a rainbow in the sky?	32	6	0	84.21	27	4	0	87.10	-	
J Why do countries have wars?	33	3	2	86.84	18	13	0	58.86	8.58	.01
K What does a coconut look like?	32	6	0	84.21	22	9	0	70.97	-	
N Why is sea water salty?	32	5	1	84.21	13	17	1	41.94	12.10	.001
O How do wasps make paper?	32	5	1	84.21	27	3	1	87.10	-	
P Why does the moon stay close to the earth?	30	7	1	78.95	20	9	2	64.52	-	
R How do leaves help plants?	34	4	0	89.47	19	12	0	61.29	5.11	.02
S What is the difference between a pen and a pencil?	30	7	1	78.95	28	3	0	90.32	-	
T What is a friend?	31	6	1	81.58	25	5	1	88.65	-	

TABLE 26. (Contd.) Distribution of Correct and Incorrect Choices of Answer for the Experimental and Control Groups on the Pre-test.

Questions	Experimental Group N = 38				Control Group N = 31				χ^2	p
	✓	X	?	%Right	✓	X	?	%Right		
Definition Items										
*C What is an insect?	12	22	4	31.58	12	18	1	38.71	-	
*M What is a parasite plant?	18	15	5	47.37	14	15	2	45.16	-	
Part-Whole Item										
*H How long do bees live for?	14	18	6	36.84	16	15	0	51.61	-	
Object vs Human-Centred Item										
*G What are flowers on a plant for?	16	19	1	47.37	12	19	0	38.71	-	

* These items were repeated at the Post-test.

the Control group.

Within Appropriateness, there was no suggestion of generalization to new items. Only repeated items gave a significant difference. While repeated items in the Definitions, Part-Whole and Object versus Human-centred categories gave more substantial differences than the new ones, there was a measure of generalization for these.

TABLE 27. Mean Post-test scores of Correct Answers for Experimental and Control Groups.

Item Category	No.	Subject Group Experimental	Control	U or χ^2	z	p
Appropriateness	12	8.86	7.03	334.5	2.04	.04
Definition	2	2.53	2.43	450.5	0.41	
Part-Whole	2	1.47	1.03	16.50		.001
Object-centred	2	1.28	0.83	7.74		.05
Total	20	13.34	11.33	315.5		.02
Items from Pre-Test	8	5.63	4.60	322.0		.03
N		32	29			

Changes from Pre- to Post-test scores in Experimental and Control Groups. Table 29 shows the results of applying McNemar Tests for the Significance of Changes and Binomial tests to the differences between Pre- and Post-test scores. Apart from the two repeated Appropriateness items which showed virtually no change overall, all items had higher scores in the Post-test. While only one of these was significant in the Control group, three were in the Experimental group. The percentage correct shift in the Control group was from 43.79 to 55.76, whereas that in the Experimental group was over double this, moving from 45.88 to 71.81.

Discussion.

The general pattern of results substantiate the view that discernment of the suitability of answers to questions among nine year old children can be enhanced. Post-test comparisons of experimental and control groups showed differences in favour of the experimental group. Comparisons through time

TABLE 28. Distribution of Correct and Incorrect Choices of Answer for the Experimental and Control Groups on the Post-Test

Questions	Choices of Answer									
	Experimental Group N = 32				Control Group N = 29					
	✓	X	?	%Right	✓	X	?	%Right	χ^2	p
Appropriateness Items										
*B What is frogspawn?	25	6	1	78.12	12	17	0	31.38	7.90	.01
*P What part of the potato plant in the potato?	17	14	1	53.12	13	15	1	44.03	-	
*R When do seals leave the sea?	22	9	1	68.75	18	11	0	62.07	-	
*T How is the metal steel made?	26	5	1	81.25	18	11	0	62.07	2.61	
A How is a square like a triangle?	17	15	0	53.12	13	16	0	44.83	-	
C How is honey made?	26	6	0	81.25	20	9	0	68.97	-	
D What does a skull do?	28	3	1	87.50	26	3	0	89.66	-	
G What do toads go back into ponds for?	12	16	4	37.50	8	21	0	27.59		
I What is the difference between the two birds a swallow and a housemartin?	14	13	5	43.75	13	16	0	44.83	-	
L What is the cloth cotton is made out of?	17	15	0	53.12	22	7	0	75.86	2.49	
M Why are carrots good for us?	29	3	0	90.62	25	4	0	86.21	-	
S How can you tell when a monkey is likely to start fighting?	24	8	0	75.00	19	10	0	65.52	-	

TABLE 28. (Contd.) Distribution of Correct and Incorrect Choices of Answer for the Experimental and Control Groups on the Post-test.

Questions	Choices of Answer									
	Experimental Group N = 32				Control Group N = 29					
	✓	X	?	%Right	✓	X	?	%Right	χ^2	p
Definition Items										
•P What is an insect?	11	19	2	34.37	20	9	0	68.97	3.87	.05
N What is a parasite plant?	28	4	0	87.50	17	12	0	58.62	4.48	.05
•E What is a herbivorous animal?	16	14	2	50.00	6	23	0	20.69	4.01	.05
K What is a fish?	26	6	0	81.25	26	3	0	89.66	-	
Part-Whole Items										
•O How long do bees live for?	23	8	1	71.87	14	15	0	48.28	4.01	.05
Q How tall is a bull elephant from shoulder to foot?	24	7	1	75.00	16	13	0	65.17	2.41	
Object vs Human Centred Items										
•J What are flowers on a plant for?	29	2	1	98.62	19	10	0	65.52	6.36	.05
What are blackberries on a bramble bush for?	12	19	1	37.50	5	24	0	17.24	2.96	.10

• These items were included in the pre-test.

TABLE 29. Comparison between Pre-test and Post-test Scores on the Eight Repeated Items for Experimental and Control Groups.

Questions	Percentages of Correct Answers							
	Experimental Group N = 31				Control Group N = 27			
	Pre-test ✓	Post-Test X	χ^2	p	Pre-test ✓	Post-test X	χ^2	p
Appropriateness Items.								
What is frogspawn?	38.70	77.41	9.09	.01	37.03	44.44	-	
When do seals leave the sea?	77.41	67.74			51.88	62.96	-	
How is the metal steel made?	83.87	83.87			59.25	59.25	-	
What part of the potato plant is the potato?	38.70	51.61			33.33	44.44	-	
Definition Items.								
What is an insect?	25.8	32.25			35.48	70.37	Binomial	.02
What is a parasite plan?	45.16	83.87	4.92	.05	48.14	55.55		
Part-Whole Item.								
How long do bees live for?	35.48	74.19	3.36	.10	51.88	46.15	-	
Object vs Human-Centred Item								
What are flowers on a plant for?	41.93	93.54	11.52	.001	33.33	62.96	3.27	.10
Percentage Correct Average	45.88	71.81	no test		43.79	55.76	no test	

showed that the experimental group had registered a significant improvement.

At the level of individual items these general conclusions have to be qualified. In the comparison of the post-test scores of experimental and control groups, thirteen items gave no discrimination. Of these, six were answered correctly by over seventy per cent of the children. All but one (T) of these were new items for the post-test and can be discounted perhaps as being too easy. One of the remainder (Q) was close to achieving significance in favour of the experimental group. The other six were all in the Grammatical Appropriateness category.

An examination of the change scores shows one dramatic increase in the control group (Item P). Why, we do not know. It is possible that this class had been told what an insect was during the intervening period. Within the experimental group, it was again the Grammatical Appropriateness items which were least responsible to training.

The simplest explanation of this variability would point to a major difference between this category and the other three. Each of the other three required a specific discrimination: the incorrect answer differed from the correct one in a single constant manner. Theoretically children could have as well learned to reject the incorrect answer as to choose the correct. This was not true for Grammatical Appropriateness, where incorrect answers took on different guises. Learning to reject a specific type of answer would not have generalized to all other instances. Hence, to learn what was correct required more complicated and varied discriminations. In this context it is noteworthy that generalization to new items occurred for the other three categories, but not for grammatical appropriateness.

The conclusion that would follow from this argument is that, initially, training has to focus on specific types of question and the particular discriminations associated with each. This is not of course surprising, although it could have been the case that the experimental children would have become sensitized to problems of grammatical appropriateness as a whole and they might have decided to master each contrast and the system as a system. This last might be overoptimistic for nine year olds, but one might have expected them to learn the rules governing each type of question. They did not and therefore need to be taught the question-answers discriminations one by one, emphasising how each differs from all the others.

It will also be true that some types of question are more difficult to understand than others, so that for any particular child at a particular time there may be limits to what he can learn about question-answer relationships. However, all types of item achieved substantial majorities of correct scores for at least one example, often what appeared to be the simplest, e.g. 'What is a fish?' That most children were able to answer this question correctly strongly suggests, but does not entail, that they have some understanding of a definition demanding question. The conclusion is not obligatory because the children may have learned a number of specific instances but not yet constructed and understood the general rule. If all categories did achieve at least one high set of scores because the children understood the question correctly, it may be fair to suggest both that other instances of the category could be taught and the general rule learned and that such understanding is unlikely to be beyond the intellectual capacity of the ignorant minority. Whether this view has any weight is examined in the next chapter.

The difficulties were not wholly in understanding of the question types. That this is so is supported by a brief study of some of the post-test items on which the experimental group failed to excel. One (I) was the longest item for which the correct choice had two sentences, one of fourteen and the other of eighteen words. The incorrect choice had three sentences and also included all the relevant answer information it was incorrect because it contained some irrelevant information as well. Item L had a strange question and a correct choice that might have been seen as almost uninformative. The same point could be made about Item A. Item P had a correct answer that added superfluous and therefore irrelevant information, whereas the incorrect choice was wholly irrelevant. Such weaknesses in design could be overcome in subsequent training investigations.

While these sources of confusion might have been avoided, it is more difficult to see how controls could be introduced to cope with differential familiarity with materials. This operates to give false impressions of competence when children just happen to know the correct answer to specific questions. It operates in the other direction where the complexity of or unfamiliarity with the content and form obscure a basic competence. Henle (1942) showed long ago that adults appreciation of the validity of arguments was affected by much more than their logical structure. Wason and Johnson-Laird (1972) showed ineffectual problem-solving with one set of materials transformed into success by changing the materials while the formal problem remained identical. Distractions of various sorts may have acted to reduce levels of performance, and although there is no reason why they should have acted differentially on the experimental and control groups, the net result could be to obscure differences that were really there! Ultimately it is desirable for people to be able to dissociate form and content and be able to pass judgement on form without interference from content. It is also useful for people to re-organise problems into forms which they find easier to solve. One often suspects that children find it easier to solve numerical problems when these are posed in numerical form than when they are expressed in words and given substance.

Another design feature that would need to be considered in any future investigation would draw a distinction between two kinds of item: those where very young children would be expected to choose the 'wrong' answer all the time and then eventually reverse this and those where younger children would either say they do not know or choose randomly. A fifty-fifty split in responses could mean that half the children have learned the 'right' answer or it could mean no one is doing more than guessing. Not only are different statistics needed to analyse the results in the two cases, they are of different theoretical interest. Strictly speaking, it would be betterto encourage children to say that they do not know if they do not rather than to encourage them to make a choice as we did here. This would ease the problem of distinguishing between the two, although as we have seen elsewhere (chapters 6 and 7) children of eight and nine are reluctant to admit their ignorance.

These considerations do not make it likely that the improvements in fact obtained are artefacts - quite the reverse. It is reasonable to conclude that teaching of the kind adopted here for what was after all a very brief amount of time could be used with a high degree of success to sharpen children's knowledge of question-answer relationships. To be more successful, closer attention should be paid to each type of discrimination required for each type of question. By type of question, we mean the 'referential categories' mentioned in chapter 3, with all their exponents. Of types of discrimination we have looked only at grammatical appropriateness which is only one cell in the matrix formed by considering appropriateness, completeness and presupposition for each of mode, grammar, lexis and content. If, however, skills in the question-answer exchange have the fundamental significance for learning that we think they have, these are all important and should be taught as early as possible, - and preferably before that. What may be too early, we turn to next.

APPENDIX.

Pre-Test.

NAME:

Here are some questions and some answers. Which answers do you think are best? If it is the first one put 1 in the box. If it is the second one, put 2 in the box.

EXAMPLE.

1. Q. Why does the sun look quite small to us?
   A1. It is really much bigger than the earth.
   A2. It is because it is so far away.

11. Q. What is the name of the biggest town in England?
   A1. London is the biggest town in England.
   A2. Millions of people live in the biggest town in England.

NOW DO THESE

A. Q. What causes volcanoes?
   A1. The Italian volcano, Stromboli has been erupting for 2,500 years, sometimes gently and sometimes very fiercely..
   A2. There is a split in the crust of the earth and melted rock and gas rushes up from the inside of the earth.

B. Q. Why is it wrong to spoil peoples' things?
   A1. You get punished if you spoil peoples' things.
   A2. You would not like it if somebody spoiled your things.

C. Q. What is an insect?
   A1. An ant is an insect, and so is a bee and all sorts of beetles.
   A2. An insect is a small animal with six legs and three parts to its body.

D. Q. When do seals leave the sea?
   A1. Seals leave the sea when it is time to breed.
   A2. Seals leave the sea so that they can breed.

E. Q. What is the difference between a monkey and a gorilla?

A1. A gorilla is much bigger than a monkey and has no tail.

A2. They are both called primates. Humans are primates too.

F. Q. When do we see a rainbow in the sky?

A1. We see a rainbow when the sun is shining after it has been raining.

A2. A rainbow shows up all the different colours that go to make up normal light.

G. Q. What are flowers on a plant for?

A1. The flower makes seeds from which new plants can grow.

A2. The flower is the beautiful part of the plant which we can pick.

H. Q. How long do bees live for?

A1. Queen bees may live for as long as four or five years.

A2. Most bees do not live longer than about eight weeks.

I. Q. What is frog spawn?

A1. A mass of jelly containing frogs' eggs.

A2. The jelly protects and feeds the baby tadpoles.

J. Q. Why do countries have wars?

A1. Sometimes one country wants to rule over another country and there is war.

A2. Sometimes countries have lots of battles against one another and that is a war.

K. Q. What does a coconut look like?

A1. A coconut is a large round nut with a touch hairy covering.

A2. A coconut is the biggest seed in the world.

L. Q. What part of the potato plant is the potato?

A1. The potato is part of the stem of the plant. It contains feed for the plant and is underground.

A2. The potato contains vitamin C which is good for us. We eat a lot of them in England.

M. Q. What is a parasite plant?

A1. A plant that gets its food out of other plants is a parasite plant.

A2. The mistletoe is a parasite plant.

N. Q. Why is sea water salty?

A1. Water that is salty is not very good to drink. It has a nasty taste.

A2. As rivers go along, they take some salt out of the ground. They carry this salt into the sea and it stays there.

O. Q. How do wasps make paper?

A1. Wasps make paper and use it to make their nests with. They made paper millions of years before men ever thought of it.

A2. Wasps cut off chunks of dried wood with their strong jaws, and chew them. They spread out the mixture and it dries as paper.

P. Q. Why does the moon stay close to the earth?

A1. There is a force like in a magnet between the earth and the moon.

A2. Some people believe that the moon used to be part of the earth.

Q. Q. How is the metal steel made?

A1. Iron is made very hot and some stuff called carbon is added to it.

A2. Many things we see around are made out of the metal steel.

R. Q. How do leaves help plants?

A1. Although plant leaves do not look active, they are busy all the time.

A2. Leaves give off water and this helps to cool the plant.

S. Q. What is the difference between a pen and a pencil?

A1. You use a pen to write with and you can write with a pencil too.

A2. A pen uses ink to write with and a pencil has a lead in it.

T. Q. What is a friend?

A1. It is a good thing to have a friend especially when you are lonely or in trouble.

A2. A person who is good to you, and helps you and who you get to know is called a friend.

Post-Test.

NAME:

Here are some questions and some answers. Which answers do you think are best? If it is the first one, put 1 in the box. If it is the second one, put 2 in the box.

EXAMPLE.

1. Q. Where does coal come from?
   A1. It comes from under the ground.
   A2. It is black and hard.

11. Q. How long does it take to get to America from Southampton in a ship?
   A1. It is quickest by 'plane.
   A2. It takes about 5 days.

NOW DO THESE.

A. Q. How is a square like a triangle?
   A1. A square is a shape and so is a triangle.
   A2. A square has got four sides and a triangle has got three sides.

B. Q. What is frog spawn?
   A1. A mass of jelly containing frogs' eggs.
   A2. The jelly protects and feeds the baby tadpoles.

C. Q. How is honey made?
   A1. The bee keeper has to get the honey out of the honeycomb in the beehive. First of all he puts smoke into the beehive.
   A2. A worker bee eats nectar which comes from flowers. It is turned into honey inside her body.

D. Q. What does a skull do?
   A1. It is the set of 22 bones of our head and face all joined together into a hollow case.
   A2. It protects our brain and other things in our heads which are soft and could easily be damaged.

E. Q. What is a herbivorous animal?
   A1. A gorilla is a herbivorous animal although he looks fierce.

A2. An animal which eats plants and not other animals is a herbivorous animal.

F. Q. What is an insect?

A1. An insect is a small animal with six legs and three parts to its body.

A2. An ant is an insect and so is a bee and all sorts of beetles.

G. Q. What do toads go back into ponds for?

A1. When it is time to lay their eggs.

A2. To lay their eggs.

H. Q. What are blackberries on a bramble bush for?

A1. The blackberries are the fruit with seeds inside. When animals, birds and people take the fruit they help to spread the seeds.

A2. Blackberries are a fruit. When we have picked them we can eat them, raw, cooked or in jam.

I. Q. What is the difference between the two birds, a swallow and a house martin?

A1. A swallow can fly at over 50 miles in an hour. It has a blue back and a red throat. A house martin has a white patch.

A2. A swallow has a red throat and no white patch on its blue back. A house martin does not have a red throat but does have a white patch on its back.

J. Q. What are flowers on a plant for?

A1. The flower is the beautiful part of the plant, which we can pick.

A2. The flower makes seeds from which new plants can grow.

K. Q. What is a fish?

A1. A shark is a fish and so is a herring and a sardine.

A2. A fish is a type of creature that lives under water and breathes through some things called gills.

L. Q. What is the cloth cotton made out of?
A1. Some white stuff that grows round the seeds of the cotton plant.
A2. Sometimes cotton is mixed with other different materials to make clothes.

M. Q. Why are carrots good for us?
A1. The carrot is really the root of the carrot plant.
A2. Carrots contain vitamin A which helps you to grow properly and see well.

N. Q. What is a parasite plant?
A1. A plant that gets its food out of other plants is a parasite plant.
A2. The mistletoe is a parasite plant.

O. Q. How long do bees live for?
A1. Most bees do not live longer than about eight weeks.
A2. Queen bees may live for as long as four or five years.

P. Q. What part of the potato plant is the potato?
A1. The potato is part of the stem of the plant. It contains food for the plant and grows underground.
A2. The potato contains vitamin C which is good for us. We eat a lot of them in England.

Q. Q. How tall is a bull elephant from shoulder to foot?
A1. The tallest bull elephant we know about is one that was about 12 ft. 9 inches tall.
A2. Bull elephants are generally about 10 ft. to 10 ft. 6 inches tall on average.

R. Q. When do seals leave the sea?
A1. Seals leave the sea when it is time to breed.
A2. Seals leave the sea so that they can breed.

S. Q. How can you tell when a monkey is likely to start fighting?
A1. When it feels cross, a monkey is likely to start fighting.
A2. When it pushes its lips forward and keeps them tightly pursed together, a monkey is likely to start fighting.

T. Q. How is the metal steel made?

A1. Iron is made very hot and some stuff called carbon is added to it.

A2. Many things we see around us are made out of the metal steel.

CHAPTER 9.

QUESTION ANSWER LINKS AND AGE

Introduction.

Through the good offices of the headmaster* of a council estate primary school in an LEA neighbouring that from which the other schools were drawn, it became possible to examine age trends in children's competence to select answers formally appropriate to questions posed. The immediate point of interest was that age related changes in competence might throw some light upon which kinds of question-answer links are most easily taught. In the training experiment of chapter 8, improvements in the experimental group were not general to all question-answer types. It could be that these are those which show a gradual increase in percentage correctness with age. On the other hand, there might be dramatic age-linked changes on particular items: performance might be steady from ages eight through ten and show a dramatic improvement at eleven. Such items might be less responsibe to training in nine year olds than those which show a leap between nine to ten.

We have already seen how a small change in instructions could alter the behaviour of eight and nine year olds (chapter 6), and we thought it worthwhile to use instructions contrasting preference and evaluation. Do children discriminate between what is correct or right and what they like? Are the two synonymous or independent? With the numbers of children available it was possible to examine the problem. It is important because we suspect that we adults are rather careless in what we say to and demand of children. In chapters 1 and 2 we have stressed the idea that children are trying to make sense of the world within their intellectual limits.

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* Footnote. We are pleased to record our debt to H. Probert for his considerable help in the conduct of this study.

Do we make it easy for them by being clear in the distinction between what one prefers and what is correct or does this not matter?

Method.

Design. Two conditions were involved in this investigation, one of the two classes in each of the four age groups of subjects being arbitrarily allocated to each condition. The two conditions varied only in the wording of instructions for the presentation of the task. One condition required the subjects to indicate which of the two answers question they liked better, while the other condition asked which answer they thought better.

Subjects. The subjects of this investigation were the pupils of both sexes in a council estate primary school. All the children present when the investigation was carried out were included as subjects. There were four age groups in the school (8+, 9+, 10+ and 14 year olds), with two mixed ability classes at each level. Since the investigation took place in the Summer term most of the children would have passed their next birthday, e.g. 8+ were mostly nine.

Materials. Following the precedent set in the earlier investigation, it was considered unnecessary to use exactly the same items employed earlier. Seven of the Appropriateness items and one Part-whole item devised for the earlier post-test gave no interesting results and were therefore replaced. Extra definitional and object versus human centred choices were included to increase their weighting. This gave eight appropriateness, five definitional, (a sixth was eliminated subsequently), three object versus human-centred and two part-whole items and one oddment, combining appropriateness and object- and human-centredness.

Each subject was presented with a three-page form on which were twenty main items preceded by two example items. Each item consisted of one question followed by two possible answers. Underneath the answers was a half inch

TABLE 30. Numbers of Subjects as a Function of Age, Sex and Experimental Condition.

	Year 1 8 years old		Year 2 9 years old		Year 3 10 years old		Year 4 1 years old	
	C1 Preference	C2 Evaluation	C1 Preference	C2 Evaluation	C1 Preference	C2 Evaluation	C1 Preference	C2 Evaluation
Boys	20	16	16	13	15	22	16	13
Girls	14	13	10	13	21	16	14	16
Total	34	29	26	26	36	38	30	29

square box in which the subject was to indicate his choice of answer, 1 or 2 in each case. The twenty items were designated alphabetically A to T. One item 'G' had to be eliminated from the analysis since it was discovered, after presentation, to contain a serious misprint. The content of items was broadly in the realm of natural history. The order of presentation of items was constant. The items were:

EXAMPLES.

I. Q. Why does the sun look quite small to us?
A1. It is really much bigger than the earth.
A2. It is because it is so far away.

II. Q. What is the name of the biggest town in England?
A1. London is the name of the biggest town in England.
A2. Millions of people live in the biggest town in England.

NOW DO THESE.

A. Q. How long do bees live for?
A1. Queen bees may live for as long as four or five years.
A2. Most bees do not live longer than about eight weeks.

B. Q. What are blackberries on a bramble bush for?
A1. Blackberries are a fruit. When we pick them, we can eat them, raw or cooked or in jam.
A2. Blackberries are the fruit with seeds inside. When animals birds and people take the fruit, they help to spread the seeds.

C. Q. When do seals leave the sea?
A1. Seals leave the sea so that they can have their young ones.
A2. Seals leave the sea when it is time to have their young ones.

D. Q. How do wasps make paper?
A1. Wasps cut off chunks of dried wood with their strong jaws, and chew them. They spread out

the mixture and it dries as paper.

A2. Wasps make paper and use it to make their nests with. They made paper millions of years before man ever thought of it.

E. Q. Where does the bluebottle fly lay its eggs?

A1. On meat that is not covered over.

A2. They hatch out into blind maggots called gentles.

F. Q. What are flowers on a plant for?

A1. The flower is the beautiful part of the plant which we can pick.

A2. The flower makes seeds from which new plants can grow.

H. Q. Why does the animal called a stoat go white in winter?

A1. The white fur of the stoat is called ermine and it is sometimes used to make special robes for people.

A2. A white fur helps to hide the stoat from its enemies when there is snow on the ground.

I. Q. Why is sea water salty?

A1. Water that is salty is not very good to drink. It has a nasty taste.

A2. As rivers go along they take some salt out of the ground. They carry this salt into the sea and it stays there.

J. Q. In what way is a lion like a tiger?

A1. They are both part of the Big Cat family.

A2. Tigers are usually a bit bigger than lions.

K. Q. Why do conker trees have conkers on them?

A1. Then some people can collect conkers and some people can play with them, but they are poisonous to eat.

A2. The conkers are the seeds and will grow into new trees. The new trees will take the place of the old tree when it dies.

Note: Item G contained a misprint and had to be scrapped.

L. Q. What is a herbivorous animal?
A1. A gorilla is a herbivorous animal even though he looks fierce.
A2. A herbivorous animal is one which eats plants and not other animals.

M. Q. What do toads go back into ponds for?
A1. When it is time to lay their eggs.
A2. To lay their eggs.

N. Q. How long is a tiger?
A1. They are different sizes but about 9½ feet is a usual length.
A2. There are some giant tigers from a place called Siberia which are 13 feet long.

O. Q. What is a fish?
A1. A shark is a fish and so is a herring and a sardine.
A2. A fish is a type of creature that lives underwater and breathes through some things called gills.

P. Q. What sort of plant is called a parasite?
A1. The mistletoe is called a parasite.
A2. A plant that gets its food out of other plants is called a parasite.

Q. Q. What is frog-spawn?
A1. The jelly stuff feeds the baby tadpoles and keeps them safe when they are tiny.
A2. A mass of jelly stuff containing frogs eggs.

R. Q. What is a carnivorous animal?
A1. A carnivorous animal is one that eats other animals for food.
A2. A tiger is a carnivorous animal and has sharp claws.

S. Q. What part of the potato plant is the potato?
A1. The potato is part of the stem of the plant. It contains food for the plant and grows underground.
A2. The potato contains Vitamin C which is good for us. We eat a lot of them in England.

T. Q. What sort of animal is an ungulate?
A1. An animal that has hooves is called an ungulate.
A2. A cow is an ungulate and so is a sheep and a giraffe.

The items may be separated into four main categories as follows:-

Appropriateness Items (C, D, E, I, J, M, Q, S) These presented a choice between an answer which had a proper and exact logical connection with the question and one which did not.

Definition Items (L, T, O, P, R). These presented answers of which one offered a definition of a category in terms of criterial attributes of the category while the other gave the definition by specifying some members of the catgeory. The former type of answer was reckoned to be superior.

Part Whole Items (A, N.) The answers contained in these items either gave information about the normal case (these were judged 'better') or about an atypical case.

Object vs. Human Centred Items (B, F, K). The answers either saw phenomena in nature as serving the ends of the system of which it is part or as serving human ends of a rather arbitrary kind. The former were thought to be better answers. There was an additional item (H) which was a composite of the two types. Appropriateness and Human versus Object Centred.

Procedure. The children's headmaster administered the proceedings for each of the eight classes in turn. Children were instructed to work on their own and to write their names, ages, and sex in the appropriate places. The main instructions took one of two forms:

Condition 1 : Preference.

When each child had a form that had the initial details completed the experimenter said,

> 'Different people often answer the same question in different ways, and sometimes we like some answers better than others. Do you see the little boxes on the paper in front of you? These are for you to put a

'1' or '2' in, depending whether you like answer '1' or answer '2' to each question. Both A1 and A2 are true, but sometimes you may like A1 better and sometimes you may like A2 better. Let's all Do the ones at the top under where it says EXAMPLES. The first question is 'Why does the sun look quite small to us?, and here are two answers: 1. 'It is really much bigger than the earth! 2. 'It is because it is so far away'. If you like 1, that is the first one, better than the second one as an answer to 'Why does the sun look quite small to us?' put a '1' in the box, if you like the second one, 2, better than the first one, put a 2 in the box. Has everybody got something in the box?'.

The experimenter checked that everybody had written something in the box.

'Is there anybody who really cannot decide? Try and decide for each one which answer you like better. If you really cannot decide put an 0 in the box. Let's do the second example now. 'What is the name of the biggest town in England?' Here are two answers, 1. 'London is the nam of the biggest town in England' and 2. 'Millions of people live in the biggest town in England.' Both those things are true. Which answer do you like better to 'what is the name of the biggest town in England?'

Condition 2 : Evaluation.

When each child had a form, the Experimenter said: 'Different people often answer the same question in different ways, and sometimes we think some answers are better than others. Do you see the little boxes on the paper in front of you? Those are for you to put a '1' or '2' in, depending whether you think answer '1' or answer '2' is the better answer to each question. Both A1 and A2 are true but sometimes A1 answers the question better and sometimes A2 does. Let's all do the ones at the top under where it says EXAMPLES. The first question is 'Why does the sun look quite small to us?' and here are two answers: 1. 'It is really much bigger than the earth, 2. 'It is because it is so far away'. If you think 1, that is the first one, is a better answer than the second one, to 'Why does the sun look quite small to us?', put a '1' in the box, if you think the second one, 2, is better than the first one put a 2 in the box. Has everybody got something in the box?'

The experimenter checked that everybody had written something in the box.

'Is there anybody who really cannot decide? Try and decide for each one, which answer is better. If you really cannot decide put a 0 in the box. Let's do the second example now. 'What is the name of the biggest town in England?' Here are two answers, 1. 'London is the name of the biggest town in England' and 2. 'Millions of people live in the biggest town in England'. Both these things are true. Which do you think is a better answer to 'What is the name of the biggest town in England'?'

The experimenter then checked that everybody had something written, 1, 2 or 0 in the box, and said, 'Let's do the rest of them now.' Each item was read, i.e. each questions and both answers, and a few seconds were left for the children to decide on their choice, before moving on to the next one. The written instructions at the beginning of the form were not read out to the children.

Results and Discussion.

The boys and girls did not appear to differ from each other and were therefore grouped together. Tables 31a and 31b summarise the results.

TABLE 31a. Percentage of Correct Answers as a Function of Age and Instructions.

Type of Item	Instr. Gp.	Age in Years 8+	9+	10+	11+	X^2	p
Appropriateness.							
C. When do seals leave the sea?	1	82*	62	75	90	6.57	+
	2	52	77	66	69	6.18	-
D. How do wasps make paper?	1	47	57	33	66	8.38	*
	2	48	38	42	59	4.27	-
E. Where does the bluebottle fly lay its eggs?	1	44	23*	42*	77	12.24	**
	2	55	62	68	72	3.46	-
I. Why is sea water salty?	1	52+	65	86	87	15.64	**
	2	76	65	71	93	5.17	-
J. In what way is a lion like a tiger?	1	56*	77	100*	97	25.63	***
	2	86	85	82	97	4.00	-
M. What do toads go back into ponds for?	1	50	54	56	57	-	-
	2	55	50	57	55	-	-
Q. What is frog-spawn?	1	21*	65	44*	70	18.81	***
	2	50	40	78	62	10.64	*
S. What part of the potato plant is the potato?	1	47	38	36	87	21.47	***
	2	34	35	58	86	19.45	***
Total Appropriateness	1	50	55	59	79	N/A	
	2	57	56	65	74	N/A	
	1 + 2	53.5	55.5	62.0	75.0	N/A	
Odd Item							
H. Why does the animal called a stoat go white?	1	74	77	89	100	10.47	*
	2	72	85	95	100	13.10	**

Instruction Group 1 was asked for Preference, Group 2 Evaluation.

Significance levels are for within or between groups: +<.10, *<.05, ** <.01, *** <.001

TABLE 31b. Percentages of Correct Answers as a Function of Age and Instructions.

Type of Item	Instr. Gp.	Age in Years 8+	9+	10+	11+	X^2	p
Definition							
L. What is a herbivorous animal?	1	47	69	66	83	5.64	-
	2	49	46	71	90	14.52	***
T. What sort of animal is an ungulate?	1	44	40	50*	77	7.88	*
	2	66	62	87	72	6.42	+
O. What is a fish?	1	82	69	92	100	14.03	**
	2	66	88	100	100	25.15	***
P. What sort of plant is called a parasite?	1	44	50	69+	83	11.16	**
	2	48	38	89	86	26.00	***
R. What is a carnivorous animal?	1	38	23*	47*	93	29.84	***
	2	52	54	76	76	7.72	+
Part-Whole							
A. How long do bees live for?	1	44	54	50	76	5.04	-
	2	31	54	71	93	24.29	***
N. How long is a tiger?	1	79+	69	61	93	13.74	**
	2	54	73	73	83	8.07	*
Object vs. Human-Centred.							
B. What are blackberries on a bramble bush for?	1	47	42	64	53	3.80	-
	2	52	42	71	59	5.14	-
K. Why do conker trees have conkers on them?	1	50	69	86	93	19.43	***
	2	62	77	95	97	11.60	**
Totals							
Definitions	1	51	50	65	87		
	2	55	58	85	85	N/A	
	1+2	53	54	70	86		
Part-whole	1	60	61	55	85		
	2	41	63	71	88	N/A	
	1+2	50.5	62	63	86.5		

TABLE 31b. (Contd.) Percentages of Correct Answers as a Function of Age and Instructions.

Type of Item	Instr.	Age in Years				X^2	p
	Gp.	8+	9+	10+	11+		
Object vs. Human Centred.							
	1	53	63	80	79		
	2	57	69	83	86	N/A	
	1+2	55.5	66	81.5	83.5		

Instruction Group 1 was asked for Preference, Group 2 Evaluation Significance levels are for within or between groups:

+ <.10, * <.05, ** <.01, *** <.001

Preference and Evaluations. Chi square tests were used to examine differences attributable to differences in instructions for each item within each age group. With seventy six comparisons being made, we must be careful not to try to explain what has happened only by chance. The three differences at the ten per cent level and the ten at the five per cent are not greatly in excess of chance, but that eleven of these favoured the Evaluation rather than the Preference condition and that none occurred in the 10+ group encourage some further exploration.

A simple count of the number of items for which Evaluation demands lead to higher scores than Preference requests, shows that this is true of 65 per cent of items for the 7+ group (p = .21), 70 per cent for the 8+ group (p = .11), 83 per cent for the 9+ group (p = .002) and 50 per cent in the 10+ children.

It would be rash to read too much into these differences, but it could be that younger children fail to discriminate between liking an answer and judging it to be better. If thev like it, they judge it to be better. Between 7+ and 9+ there is an increasing power to discriminate with the consequences that asking for 'correct' answers leads increasingly to better performance. By age eleven this discrimination is effectively complete. We could express the apparent lack of difference is one of two ways. We could say that by eleven children like what is correct or we could argue that by this age they see it as absurd to prefer a wrong answer to a correct one - liking is independent of judgement and yet covaries with it.

Age Changes.

Sixteen of the nineteen items showed significant improvements in correctness for older children. Two appropriateness and one object-versus human-centred item did not give differences. Why not, we do not know but some reasons can perhaps be suggested. Pairs of answers in items were usually matched on length, linguistic structure and also content where these factors were independent of the experimental variables, i.e. appropriateness, definition, etc. In fact this was not done in every case, but this failure may shed some light on a particular likely source of difficulty.

The appropriateness item with the question 'What is frog-spawn?' which occurs in the pre-test (I) and the post-test (B) of the Intervention study and also in the Age study (Q), has as its appropriate answer one that involves grammatical presupposition (see chapter 3) of structures in the question. The inappropriate answer requires no structures of the question to be presupposed. This item obtained the second lowest level of correct choices of all pre-test appropriateness items, a level which was in fact below fifty per cent. Another item in the Age study similarly has an appropriate answer which presupposes structures in the question while the inappropriate one does not. This is the item with the question 'Where does the bluebottle fly lay its eggs?' In the Age study these two items account for four out of the seven incidences of superior answering following instructions to select the better as opposed to the preferred answer. Preference seems to draw children away from selecting a grammatically dependent answer even though it is more appropriate. It may be that the low redundancy in such dependent answers, makes them difficult, and within a limited time it is harder to associate them with their question and assess the validity of the connection.

There is one item in which both appropriate and inappropriate answers involve grammatical presupposition. The item with the question 'What do toads go back into ponds for?' was present in the Intervention post-test (C), where relatively low scoring was obtained by both experimental and control groups and there was no significant difference between the two. It was also present in the Age study and yielded no differences between the age groups. The level under both presentation conditions varied only between fifty and fifty seven per cent of correct responses. In such an item both answers would pose a problem in matching information given with information requested. There would not be the possibility of making the correct choice through the easier elimination of the wrong answer as in the case where only the appropriate answer involves presupposition. Where the content of items is very familiar, it would seem unlikely that the need to presuppose would cause difficulty. It is very common in normal conversation to make use of this economical device. Thus 'Eight o'clock' would be a more common reply to 'What is the time?' than would 'The time is eight o'clock'.

Items undoubtedly varied among themselves in terms of their difficulty. Greater familiarity and simplicity would seem likely to lead to a higher level of correct answer selection. Evidence for the relevance of familiarity of content to a task of this sort has been mentioned in an earlier discussion (chapter 8). The sort of unfamiliarity in the item with the question 'What do toads go back into ponds for?' is similar to that found in its 'pair' item with the question 'When do seals leave the sea?' in that it might well not be known that toads go *back* to ponds for any particular reason any more than that there is a reason why seals *leave* the sea. There is a generally higher level of correct answering to the question about seals though, and some evidence of an age difference (see Tables 31a and b). It would therefore seem likely that it is unfamiliarity compounded with presupposition that makes the question of the toads difficult even for older children.

It is the general pattern of increase in percentage of correct choices with age that causes us to examine the exceptions as we did with the item concerning the return of the toads to discover particular sources of difficulty. One other item (B) with the question 'What are blackberries on a bramble bush for?' in the Age study yielded no significant age differences. This was also a 'What for?' question, not designed however to test appropriateness of answer selection, but to examine human vs object-centredness of interest. In this case, there is about fifty per cent level of correct selection except in the 9+ age group which makes sixty four per cent and seventy one per cent correct choices in the 'better' and preference conditions respectively. This item could have proved rather difficult because the functional connection between the question and the object-centred answer may not be at all obvious. If the children were not aware of the value of seed dispersal, the statement that this occurred when the fruit was eaten might seem incidental. Moreover, the attracting function of blackberries is assumed rather than made explicit. The answer simply juxtaposes two facts, viz. that blackberries are the fruit with seeds in and that the seeds are scattered by animals that take the fruit. The human-centred answer is no more explicit in relating function but the human enjoyment likely to be associated with the consequences mentioned in that answer could well make it seem more recognizable and convincing as a desirable end. Thus, the more obvious functional content in the human-centred answer may have conflicted with the value of object-centredness, resulting in a failure to select simply on the basis of centredness, but also on that of apparent appropriateness. The length of the answers is likely to have cuased extra difficulty, particularly for the younger children. One might hypothesise that while the 7+ and 8+ groups found the item difficult to comprehend, the 9+ class was beginning to recognize and choose an object-centred interest. This is not shown to have increased in the 10+ class because they are worried by what they see as an unsatisfactory feature of the object-centred answer.

This item obtained a very low level of correct scoring on the post-test following training. (E group 37% correct; C group 17% correct.) The slightly higher scoring by the trained group might indicate an increase in object-centredness as shown on a difficult item by children not yet in a position to be distracted by the seeming inappropriateness which we think the eleven year olds saw.

Such factors as familiarity and simplicity of form and content obviously affect the ability of children of all the ages used to select correct answers. The improvement in selection which followed a short training programme argues that success on the task is not dependent solely on an increased language facility which comes only with an increase in age. Whether the explanation for improvement in terms of heightened attention or whether something new has been learned or realised, we are not in a position to say.

These detailed analyses may also be relevant to an issue that should have received more prior attention. All children generally answered all items. If we assume that no children knew which choice was correct and that choices were unbiased, this would mean that scores of fifty per cent would be achieved by chance. It would appear that for most items in the four categories 7+ children were responding close to chance level (Appropriateness = 54% Definitions = 53%, Part-whole = 51%, Object versus Human-Centred = 56%).

But the comments on the three items also reveal that 50% may not be the lower limit of ignorance. For example, we would expect younger children to show an initial marked preference for human-centred rather than object-centred explanations, i.e. we would expect the developmental trend for the correct answer to move from zero through fifty to one hundred per cent. This may be relevant for some types of inappropriateness. For definitions we might expect citation of instances to precede definition proper.

With these reservations in mind we can however record that all four categories of item show steady improvement across the age range of children sampled.

The Age and Intervention Studies Compared.

Table 32 shows how the choices of children in the Age study compared with those in the Intervention study for those items which were common to both. In the table the figures for the Age groups are those of the children who were instructed to choose the 'better' answer, since this corresponded more closely to the instructions given in the Intervention study. Figures for the Intervention study are in each case based on the number of children present for that condition, although, of course pre- and post-test comparisons necessarily are confined to children present on both occasions.

While certainty cannot be the level of conviction for comment, the results do not appear to be random. If an item showed improvement from pre- to post-test in the Experimental group in the Intervention study, then it gave a significant difference in the Age study. This was true of four items. One item failed to give differences in either study. One gave an Age difference but was unresponsive to training. This item showed a marked improvement

TABLE 32. Percentages of Correct Responses for Items occurring in both Age and Intervention Studies.[1]

Items	Age Study (Cond 2)[2]				X^2	Intervention Study						
	Age					Pre Test		X^2	Post Test		X^2	Post vs Pre GpE X^2
	7+	8+	9+	10+		GpE	GpC[3]		GpE	GpC		
Appropriateness												
When do seals leave the sea?	52	77	66	69	6.18	76	55	3.99*	69	62	-	-
What do toads go back into ponds for?	55	50	57	55	-	NA	NA	NA	38	28	-	NA
What is frogspawn?	50	40	78	62	10.64*	37	39	-	78	41	7.90*	9.09**
What part of the potato plant is the potato?	34	35	58	86	19.45***	37	29	-	53	45	-	-
Definition												
What is an herbivorous animal?	49	46	71	90	14.52**	NA	NA	NA	50	21	4.01*	NA
What is a fish?	66	88	100	100	25.15***	NA	NA	NA	81	90	-	NA
What sort of plant is called a parasite?	48	38	89	86	26.76	47	45	-	87	59	4.48*	4.92*

TABLE 32. (Contd.) Percentages of Correct Responses for Items occurring in both Age and Intervention Studies.[1]

Items	Age Study (Cond 2)[2] Age 7+	8+	9+	10+	X^2	Intervention Study Pre Test GpE	Pre Test GpC[3]	X^2	Post Test GpE	Post Test GpC	X^2	Post vs Pre GpE X^2
Part-Whole												
How long do bees live for?	31	54	71	93	24.29^{**}	37	52	-	72	48	4.01^{*}	3.36
Object vs Human Centred.												
What are flowers on a plant for?	59	88	92	93	17.12^{***}	47	39	-	91	66	6.36^{*}	11.52^{***}
What are blackberries on a bramble bush for?	51	42	71	59	5.14	NA	NA	NA	37	17	2.96	NA

* means $p < .05$, ** $p < .01$, *** $p < .001$

1. Numbers are based on all children present on that occasion.
2. Cond. 2 is where children said which they thought was the better answer.
3. GpE was given the Intervention programme, GpC was not.

between the 9+ and 10+ age groups, whereas three of the four showing changes in both, gave their greatest age difference between 8+ and 9+. This may be accidental, but it would not be surprising if change was most readily effected among children who would be learning in a year's time anyway. In all four cases the proportion of children gaining correct scores in the Experimental group was very similar to that achieved by the 10+ children in the Age study (78 vs. 78, 87 vs. 89, 72 vs. 71, 91 vs. 92).

While the data are not strong enough to warrant a clear set of prescriptions for action, they do suggest that question-answering skills may follow an age-related sequence and that training will be most effective if it tries to move children along this. The data suggest that ease of learning through some programme similar to that adopted here will need to take into account the length, complexity, presupposition and unfamiliarity of sample training items. For fast learning presumably all these complications should be kept minimal, but those who understand exactly what is involved in answering any particular question should not have their judgements adversely affected by complications of these kinds.

We can also note that the Intervention study showed clearer effects where choices were rendered simpler by having the answer to be rejected of a single type (definitions, part-whole, object versus human-centred) than where the wrong answer was variable in its type of wrongness. Learning should be easiest and most useful if 'wrongness' is learned in terms of a single type of the commonest errors in the first instance. It is likely that it will be strongest where types of wrongness can be described verbally as well as recognised.

The details of these problems would require more time and effort than we had available. That it would be systematic exploration can be argued on the grounds that improvements in children's question answering skills are likely to be fairly easy to produce and that these are well worthwhile effecting. Such a basic tool of inquiry demands more than a casual place in any curriculum.

CHAPTER 10.

THE RECKONING.

INCIDENTALS

The Power of Teachers.

Two of the experiments reported differences in the behaviour of children consequent upon their reception of different instructions from teachers. In the first (chapter 6), children's judgements of the sense and nonsense of questions were shown to be affected by the instructional set. If the teacher's remarks had suggested that many of the questions might be silly, then their pupils indeed found this to be the case. While there were general effects from the prior biasing, in this situation the instruction to expect a high number of silly questions appeared to have most effect when the children were ignorant of the meaning of the question; some very simple sensible questions were judged to be silly, but it was the assessment of the more complex and tortuous ones that was more likely to be influenced. The differences between groups were considerable - and wholly attributable to the utterance of but one casual remark by the teacher.

We do not know how permanent the effects are. Neither do we know anything about the frequency with which teachers and parents address casual remarks to children that do mislead or misrepresent. We suspect a high incidence of both misleading and misrepresentation. How else do children come to possess so many inaccurate 'facts' about the world? It is a frightening experience to hear a child imitate what you told it yesterday or last week, especially when you know that what you said was not quite true! We have a suspicion that adults would do better to confess their ignorance when this is appropriate, and we also have a further suspicion that we adults are generally very careless in what we say. Custom and norm require us to speak in many situations where we have nothing to say, so we make up opinions and beliefs and utter them - and the children hear and learn.

Psychologists who have spent much effort trying to understand the mental dynamics of expressions of hostility to other racial groups have neglected to see what proportion is maintained simply by the need to avoid embarrassing silences. To ascertain whether or not this is nonsense, we need to observe just what we do say to children - and think about its accuracy.

Our second example of such influence showed how subtle such influence can be. The distinction between liking an answer and thinking it better than another can be made by children in the age range studied (seven to ten year olds, chapter 9). At 10+, children treated 'like' as 'better', perhaps being shrewd enough to see that answers are oorrect or incorrect. Among the younger children there was a confusion of the two that we did not investigate further.

The result is reminiscent of the studies of Zigler and Kanzer (1962, see chapter 2) on the differential import of the 'That's right!' and 'Well done!' for children of different social class. Of an unsystematically collected sample of colleagues, teachers, and students, none thought the distinction particularly worthy of note. No wonder children confuse response-based learning and intrinsically motivated learning if adults fail to see the distinction between corroboration and praise. It is true that 'That's right!' may usually be uttered in a praising tone and that 'Well done!' will be qualified if the answers are in fact incorrect; our utterances often serve more than one function. But an ability to see the difference between the reactions of other people and the correctness of answers is vital to the emergence of an independent problem solver.

The message is that as teachers of and models for the young we need to be careful in what we say. Our words and sentences should be carefully chosen to represent what we wish to say simply, clearly, precisely, and accurately - and what we wish to say should be carefully considered for its validity before we present it to children, or even to ourselves and other adults.

The One-Answer-Only-Mentality.

It emerged as a minor theme of another series of studies of finding out, question-asking and problem solving that children appeared to see education as knowing the correct answers to questions asked by teachers (Robinson, 1974). Knowing how to find out was not valued in the same way as knowing what the answer was. While answers could be right or wrong, questions were not good or bad. Knowing the answer was all-important. In the next section we see one manifestation of this in children's reluctance to say they do not know, but the data from chapter 4 give grounds for hope. When asked to evaluate the quality of four different answers to a number of 'why' questions, the children passed generally favourable judgements on types of answers offered. There was no child who showed a pattern of one very favourable rating and three rejections.

Is it the case that children pick up the one-answer-only mentality from their school experience rather than from their limited understanding of the subject matter in hand? Do we mislead them about education? The Annual Brain of Britain belongs to someone with a prodigious store of detailed information about some circumscribed topic. All his or her replies are one-answer-only to questions posed by someone else. The knowledge is expressed only in verbal form. It is we who judge such a brain intelligent, clever or well-educated, when in fact we could describe it more accurately and precisely with different words.

The Willingness to Confess Ignorance.

In their character sketch of the good learner Postman and Weingartner (1959) mention the importance of not being upset or afraid at not knowing. Socrates had claimed that his wisdom lay in his awareness of his own ignorance.

Our children were not very Socratic. The most vigorous demonstration of ignorant guessing was in the investigation where children were asked questions about three posters that had been hanging in their classrooms for eight days. Here over twenty of the thirty questions asked were answered wrongly, and often foolishly. Children seemed to be incapable of using the 'Don't know' option.

The same phenomenon appeared in the question-answer linkage study reported in chapter 8. With a choice of one of two answers to fit each question and a success rate on the pre-test among the children of about fifty-nine percent, one is left ignorant but suspicious of the validity of the children's correct answers. 'Don't know' accounted for only 3.5 per cent of answers, leaving thirty-seven per cent incorrect. On the post-test 'Don't know' had dropped to under two per cent; the control group of twenty-nine children raised no more than one 'Don't know' out of 580 answers, of which 239 were wrong.

Does it matter that children guess at answers rather than confess their ignorance? It does seem to be pointless at best, and pernicious at worst. If children know that they do not know and are merely maximizing scores on badly designed attainment tests, our concern could focus on why the test is being used rather than upon possible harmful effects upon the children. But if they do not know the difference between what they know and what they do not know, how will they be able to learn? If education is made to consist of producing answers that other people define as right, we are back to response-based learning. Where there is a framework of knowledge and a surround of ignorance, gaps in the framework can appear and be filled. Although knowing what one does not know is not a necessary condition of learning, it may be useful to treat it as such for children at school.

The Model of Man as an Acquirer of Knowledge.

We have so far noted, incidentally, three hazards facing the developing child, all hazards created and maintained by adults. Children are credulous and will accept not only what they are told by adults, but whatthey hear adults say to each other. They are in danger of extracting ideas about education in schools that may represent an accurate analysis of faults in the system but are detrimental for their own intellectual progress. If they focus on producing responses to adult demands that adults then applaud, they are doomed to become passive receptors of knowledge for which they have no external criteria of validation. The experiments reported show all three effects in operation, but other studies were concerned with intrinsically motivated learning and its operation.

The model of man proposed in chapter 1 had one sequence of events which ran: stimuli (ambiguous, surprising, incongruous, complex, novel) ⟶ uncertainty (curiosity) ⟶ attention ⟶ epistemic behaviours (reasoning, observation, consultation). The model did not portray the additional link epistemic behaviour ⟶ learning, which then eliminates the strangeness of the stimuli and the uncertainty derived from this. Which particular epistemic behaviour will appear should be a joint function of the person's awareness of choices and his assessment of the feasibility of each reducing the uncertainty.

Only two of our experiments bore directly on links in this chain (see Duffy, 1974 for an extended review of such work).

The Arousal of Curiosity.

In chapter 5 we reported upon the differences in the quantity and quality of questions provoked by verbal descriptions, photographs, and stuffed versions of wombats, platypusses and anteaters. We would not presume to have done more than demonstrate the need for some imaginative experimentation. Stuffed animals provoked more 'obvious and silly' questions, but also more questions overall, more closed hypothesis-testing questions, and more about the behaviour of the creatures. Each form of presentation, however, appeared to increase the chances of some type of question emerging and reduce the chances of other kinds.

A suitable selection of materials can both eliminate unwanted questions and encourage the production of those relevant to the purposes of the teacher.

Suffice it to say that the actual results obtained with the Australian animals gave no reason to doubt the description of the first link in the chain proposed by Berlyne and checked in his empirical work.

But where is the volume of collated studies summarizing the substance of what has been found to be ambiguous, complex etc. for children of different ages and experience? And where is the book listing relationships found between materials used and curiosity aroused? Alas, like so many other works central to a well-founded pedagogy, they remain unwritten. When education ceases to be purely prescriptive in its use of books and materials and begins to conduct empirical studies comparing the efficacy of its technology, it will begin to raise itself from the plateau it has been on since Plato opened his Academy long long ago.

Questions as an Aid to Learning.

Two experiments examined the role of provided questions for the facilitation of learning. They only appear to be concerned with one variant of the last link in the chain: epistemic behaviours (question asking) → learning. In fact the questions were intended to have a dual function. First they should locate a gap in knowledge and play the role of stimuli giving rise to uncertainty - certainty of ignorance but uncertainty as to the correct answer. The question can then be taken over by the child and be the epistemic behaviour that if answered should encourage learning.

Since children learned virtually nothing from the wall-charts displayed (chapter 7), we could not ascertain whether or not questions had any special power to arouse uncertainty and subsequent learning. The insertion of questions of before, within, and after texts did give rise to differences in learning. Questions within the text had a double effect: they increased the chances of their answers being learned and decreased the chances of other knowledge being acquired. Whether some other device for making that substance prominent would have had similar effects we do not know.

This whole field of inquiry is of recent origin, but may eventually lead to a more intelligent use of questions by teachers (see Prosser, 1974 for a review of the literature.) At present we have no grounds for accrediting questions with motivation arousing properties. They do appear to act to focus attention, and to increase the chances of immediately relevant material being learned, but this is at the expense of other matter.

Skill in Questioning and Answering.

The arousal of curiosity, ways of finding out, and the determinants of high rates of substantive learning have not been the main focus of attention. Our emphasis has been upon knowing how to ask questions and knowing what kind of answers are appropriate to what kind of question.

Answers to 'Why' Questions.

The original point of departure for our enquiries was an investigation into social class differences in the way mothers said they would answer 'wh' questions supposedly posed by their five year old children. Bernstein's thesis (see 1972 for collected papers) about the differences in speech between members of the lower working class and middle class led us to predict that middle class mothers would provide a higher incidence of explanations in terms of class membership, causes, functions, and analogies in answer to 'why' questions.

Lower working class mothers were expected to use more repetitions of questions as statements, denials of oddity, appeals to regularity and tradition, and appeals to essential attributes. Differences found were largely consistent with the predictions made (Robinson and Rackstraw, 1966). Children's answers were shown to exhibit similar social class differences (Robinson and Rackstraw, 1972), while subsequent work has traced the relationship beyond social class into the quantity and quality of interaction between mother and child (Robinson, 1972; Robinson and Arnold, 1972).

This work caused us to worry that some children might have so little experience of genuine attempts at explanation in answer to 'why' questions, that they might fail to appreciate that these modes are, in most contexts, superior to modes that deny there is anything to be explained.

The investigation reported in chapter 4 shows these fears to be largely groundless - as far as nine year old council estate children were concerned. While these children showed a preference for functional explanations over causal and categorizing answers, they did not reject any type as invalid. They appeared not only to find scientific explanations acceptable, but also to see that there can be more than one explanation for a phenomenon. They had not yet acquired the narrowness of perspective that occasionally constricts the vision of adult scientists and philosophers to such an extent that they are unable to see that there is not just one best kind of explanation for all phenomena for all occasions.

Perhaps our earlier findings of a lesser use of scientific explanations by LWC children stemmed more from their ignorance of particular causes and classes than from their general preference for appeals to regularity or tradition.

It would be helpful to know whether or not social class differences in mode preferences for 'where', 'when', 'who' and 'how' could become more adaptive to the needs of particular circumstances than the initial data we obtained implied that it was (Robinson and Rackstraw, 1972, chapter 7.)

It would be useful to know much more about the development of the competence to understand and the satisfaction with different kinds of description and explanation arising out of questions.

The Sense of Questions.

A number of the questions used in the investigation reported in chapter 6 were odd because of the infelicity of the relationship between the particular interrogative markers and the rest of the question. The difficulty of some questions resided in anomalies or contradictions that had nothing to do with interrogatives as such, e.g. Q.24. If we could read other people's minds, how could we tell lies? Q.12. Why don't people speak with their ears?

While seventy-nine per cent of all responses judged what we had classified as simple sensible questions to be sensible, this does leave twenty per cent misjudged by the children. Although all children thought 'Who is the radio?' silly, only eight-eight per cent judged 'Where is Daddy's birthday?' to be so. It might have been instructive to have included more simple anomalies like 'When is a book?' and 'How is a sheep?'.

Even at nine not all children appear to be confident and proficient in their understanding of 'wh' words. Since the understanding is within their grasp such an omission in their education is not excusable.

Question-Answer Linkage.

With a raggedness of performance in the answering of seven year olds (Robinson, 1973) and a raggedness in the understanding of what makes questions sensible or silly among eight and nine year olds, it is not surprising to find a lowish level of understanding of the linkage between the two even in the older age group. In chapters 8 and 9 we described investigations in which test items consisted of a series of questions each of which had two answers, both true but only one an answer to that question.

When the children of the Age study (chapter 9) were asked which of the two answers were better (condition 2) the percentages of correct answers for all items (except the unclassified item H) were: 56% for 7+ group, 59% for the 8+ group, 71% for the 9+ group and 79% for the 10+ group.

With a somewhat different set of twenty items, the pre-training success rate of the eight and nine year olds in the Intervention study was the same as that of the equivalent age group in the Age study, viz. fifty-nine per cent.

In neither of these investigations was it necessary to be familiar with facts about the topic under scrutiny; an accurate and informed analysis of the form of the answer was sufficient to obtain a perfect score.

The materials dealt with three particular discriminations (definition versus enumeration of examples; answers for the whole set covered by the question versus answer for only a subset of the topic; answers focused on the human use of resources versus answers focused on the use of the attribute to the organism itself) and one general set (formal appropriateness versus various mistakes.)

Practice with about one hundred questions over a three week period raised the score of the Experimental Group so that their final score on the eight critical items was seventy two per cent. The similarity between this score and that of the 9+ children in the Age study should not be treated as more than a coincidence, but certainly learning appears to be faster if there is teaching!

And what was achieved for these particular question-answer links in those children, could be extended to a much more comprehensive set of question-answer links for many other children.

These possibilities are confined to the use of single questions and single answers. We have not considered sequences of questions. We have not considered how one learns which questions to pose to help in the solution of particular problems. We are therefore still a long way from the time when it should be possible to specify a comprehensive programme for education in the mastery and use of questions and answers.

But if we are to be serious in our professed concern to educate children to become independent general problem-solvers who enjoy the acquisition and utilization of knowledge, it is time that we began to accumulate and distribute the knowledge necessary for this. Perhaps INSTEP groups will come to play a major role in the effort.

APPENDIX.

The INSTEP Group

Raisons d'Etre of the Group

While our concern was to gain knowledge for the improvement of the education of all children, we wished to ensure that, as far as possible, whatever we found out would be of particular use to teachers educating working class children. But what should we do to guarantee that our research be of practical use as well as theoretical interest?

Complaints against research in education are several; it demonstrates the obvious or trivial; it may be theoretically enlightening, but unadaptable to the classroom; it may lie gathering dust in libraries and never reach teachers. What we had to do was devise a strategy that would reduce the force of such criticisms. Some are better anticipated by argument than by action, and it may be helpful to engage in a preliminary dialectic about these points.

The charge that research in education often goes to great pains to demonstrate the obvious may be empty or substantial. What is obvious about human behaviour and how do we justify claims that something is obvious? 'Commonsense' is sometimes cited as the mysterious repository of this wisdom. We do not wish to denigrate commonsense, but would like to distinguish between commonsense based on accumulated experience and commonsense not so founded. All of us already know much about human behaviour. It is as silly to underestimate this knowledge as it is to overestimate it. What we know has been built up by observing ourselves and others, by noticing the consequences of actions, by making guesses and checking them out by watching films and reading books - all over many years. We may have accumulated our knowledge somewhat unsystematically, it may have been left fairly unorganized, but this does not diminish its status. We have probably forgotten how and when we acquired it, but it is still useful. All we need to remind ourselves is that what we think we know has been based upon experience and that it is not 'innate', 'introspective', 'intuitive' or oddly 'subjective'. And just as its acquisition has been founded upon past experience, so it can be checked against future experience. This knowledge, if questioned, is to be defended by an appeal to present experience and evidence, and if this is what we mean by 'commonsense' there is no difficulty. Similarly, when your commonsense agrees with mine and everyone else's, no difficulties arise. It is when we have conflict and disagree about matters of fact, thi[illegible] to be resolved against the facts and not against the prestige or agonistic prowess of the contestants. 'Scientific methods' are no more than partially explicit sets of rules generally accepted as helpful prescriptions for collecting and organizing empirical knowledge. They help to resolve disputes between contesting beliefs in a way in which appeals to authority do not and can not.

This view of 'commonsense' needs to be contrasted with the notion that implies that there is a great reserve of truth in an unwritten book entitled 'Commonsense for Everyman'. Once we abstract commonsense from particular matters, we are in error. 'Commonsense' does not exist any more than does 'yellowness'. When we explain behaviour with proverbs we are playing a related game. If every proverb has its opposite you cannot explain anything by reference to one - unless you can first specify conditions which discriminate between the appropriate application of each proverb and its antithesis. To be proverbially wise may be to be foolish. 'Spare the rod and spoil the child' might be an inspiration for investigation, but it is not an explanation of children's behaviour. To appeal to commonsense for authenticating a a belief is not an explanation either; it is to suggest that no explanation is necessary.

By all means then let us use what commonsense says to give us ideas, but let us also remember that disagreements or denials about empirical matters can eventually be answered only with systematically acquired, publicly describable and communicable evidence. (In teaching psychology all requests so far made of students for the 'commonsense' viewpoint on a topic have so far yielded a diversity of opinions from the audience. Try it!)

There are several different long-standing traditions about the nature of children and the conditions optimal for their development, and while it is proper and sensible for us to retain our current beliefs pro tem, we must always be humble enough to remain open to evidence that contradicts them,however obvious and well-founded our convictions may appear to be. What is obvious at one place in one point of time often has an inappropriate dogmatism associated with it. Such beliefs have a strange insularity. We forget so quickly that what was revolutionary yesterday is obvious today. Historically, claims about the nature of the world that ran counter to some sociologically established orthodoxy were sufficient grounds for ridicule, imprisonment, torture and murder. This is of course still true today. Today is but tomorrow's history. Similarly, we are liable to think that the groups to which we belong do everything in just and sensible ways,and that no one else does (or vice versa). Other countries muddle about in a chaos of incompetence and injustice. By maintaining such ethnocentric attitudes and remaining isolated from other possibilities, we can delude ourselves into the commonsense of what we are doing now. What is so odd is that, whereas any normal adult in our society is capable of understanding these points, so few of us reveal this understanding and follow out its implications, the main one of which is simply to test the validity of ideas against empirical evidence.

There are also good reasons for collecting and writing down 'commonsense'. Once it is duly expressed in scientific jargon, it can be integrated into the sciences. These descriptive and explanatory systems of symbols arranged at a succession of levels of generality and abstractness are part of each generation's heritage from its predecessor. The more efficiently such knowledge can be transmitted the greater is the potential of future generations. Schools are, after all, intended as a means of rendering this transmission more efficient. Hopefully, teachers too can be taught both how to teach and what children are like without the pains of failing to find it all out through unguided discovery learning. And we can render the task facing future teachers easier by acquiring and making such knowledge available.

Not only do we social scientists occasionally demonstrate the obvious unnecessarily, we are also liable to propound the trivial. Sometimes the triviality derives from nothing more than a lack of genuine interest in topics, or a need to do a little piece of research to gain some certificate, degree or higher salary. Sometimes we become so obsessed with the scientific status of our activities that we forget our substantive problems and remain trapped in a succession of laboratory artefacts.

While it is always hazardous to assert that a result obtained may have no practical consequence, it is less so to suggest that it is easier to see immediate applications of some activities than others. For example, a demonstration of remarkably efficient learning achieved with expensive equipment in a sound-deadened room with a one-to-one teacher-pupil ratio is less likely to invade the classrooms of the country in the immediate future than a similar success achieved with cheap materials tested in crowded, bustling settings. We need to realise, however, that research is both short-term and long-term. While research that solves a known and pressing problem may have an immediately observable benefit, long-term, often more theoretically-oriented, activities may eventually lead to profounder changes eventually. It is inevitable for at least two reasons that we cannot foresee what sort of long-term research is going to be useful. Firstly, what is deemed useful in fifty years time may be different from what is currently valued. Secondly, it is part of the essence of attempts to dispel ignorance that one cannot prejudge the nature of the solutions that will be found. Clearly, for society as a whole, one needs a balance in research programmes. In fact we have this, although the climate of official opinion in Britain is currently stressing the demand for immediate relevance a little more vigorously than in the past. What is regrettable is that this diversity which is desirable, becomes a set of status hierarchies within which each interested group is tempted to inflate its own importance by diminishing the activities of other groups rather than by pursuing its own area of commitment as best it can.

Long-term general theoretical research is likely to be prized by university academics and despised by practitioners faced with large classes of unruly adolescents. The development of effective rule-of-thumb techniques for enabling children to understand some very limited but important point in mathematics is unlikely to commend itself to grand theoreticians. Rhyming jingles that would enable children to master rules of spelling in English are hardly likely to cause 'progressive' educationists to jump with delight. Yet, if we pause to consider what a simple handbook of spelling rules set in mnemonics could achieve, we might come to realise how many occasions of distress and humiliation could be prevented, chronic anxiety averted, and wasted time saved by the production of just such a book. But, alas, the author of such a book would not find himself promoted up the academic ladder. He might make a monetary fortune to console himself.

That all of us in the educational trade are rather ignorant is inevitable and needs no excusing. When, however, we justify our ignorance by pointing to the irrelevance of inferiority of the activities of others, we are probably guilty of false pride and doomed to learn but little. When the disparate groups of persons allegedly concerned to educate children begin to co-operate a little more whole-heartedly in an atmosphere of mutual respect, they may begin to make faster progress and be more satisfied with their own roles in the enterprise.

That potentially useful research can serve only to fill library archives raises the more general problem of information diffusion in education. We have short-circuited these issues by writing a book rather than an unpublished research report, but it may be appropriate to mention two difficulties that need to be overcome if teachers are to be actively concerned to learn more both about the educational process and about the children enjoying the experience.

At present the organization of education does not encourage in-service education. The Government White Paper based on the James Report promises changes. Teachers' Centres are a recent invention and mark one necessary structural change. Teachers' Centres remain relatively rare and small; they are used by only a minority of the profession. Many courses and conferences require voluntary attendance during out-of-school hours, often at the end of a full teaching day. These are not optimal conditions of learning. While many Centres may have loose or strong connections with local colleges, universities, and advisers in LEA's, links to the Department of Education and Science, to the National Foundation of Education Research, and perhaps most important, to the Schools Council are casual or absent. The Schools Council publishes widely but the social structure of the educational system lacks organizations intermediate between itself and the Teacher's Centres and schools. Perhaps we shall soon see changes.

Even if we do, it is unlikely that teachers will be given the opportunities and be encouraged to attend worthwhile courses simply to improve their teaching knowledge and skills. The James' Report clearly envisages a dramatic change in the definition of a teacher. Like many other jobs, teaching is to be seen as an activity requiring time out from production for re-training and development. Who would enter a dentist's surgery full of thirty year old equipment or who would allow their doctor to prescribe the medicines contemporary only to his period of initial training. When in-service training gets under way on an institutionalized scale, it will probably consist mainly of new pills and rules for personal hygiene. That is, there will be an emphasis on technology, new ways of teaching reading or mathematics, new ways of presenting materials. But materials cannot be more efficacious than the characteristics of the learner allow, and it is unlikely that there will be a rush in the demand for or the provision of courses aimed to illuminate teachers' understanding of the development and nature of the psychological processes of relevance to education.

At least the attitude has died which assumed that graduates in a subject knew how to teach that subject. Who would have allowed their child to be medically treated by a doctor who had only read books on diseases? Although this absurdity has faded, it remains true that education courses do very little to inform students about child development or about how to teach; these remain fringe benefits rather than the core of courses.

Psychology can and ought to contribute much more to education, but both psychologists and teachers will have to change their attitudes to each other if there is to be any significant progress.

Not only are teachers generally ignorant about child development, they are normally not trained even to evaluate the work that has been done in this area of study.

Investigations allegedly claiming that certain techniques and materials lead to faster learning have to be criticized and not simply taken on trust. There are criteria that have to be satisfied before it is sensible to take claims about findings seriously. Knowing which questions to ask and what kind of answers are satisfactory ought to be weapons in the armoury of all adults in the society. Specifically, what is being suggested is that teachers should be scientific about their teaching. In one sense, every act of a teacher designed to help children learn is part of an experiment. The act selected is but one of an array that might have been chosen. Whether it was the one most likely to have led to the children learning is an empirical question to be answered by experimentation. In our view, teachers should be competent experimenters in their own right. They are expected to adopt innovatory schemes. To do so with conviction and commitment presupposes a favourable attitude towards the scheme. What better means of achieving conviction is there than to have taken part in an experiment that showed the superiority of the innovation? Perhaps if these processes of 'persuasion' were used more often, there would be fewer premature adoptions of fashionable and unevaluated materials. If teachers had been more forceful in their criticisms of new techniques and schemes, how much better might these have been. It would be unfair to single out a few schemes for criticisms because the disease of non-evaluation is endemic. Reading schemes, science packs, and history kits appear. What objectives have they? How do these differ from their predecessors for both the quantity and quality of children's learning?

Teachers' favourable comments are a useful confidence booster to the innovators, but are no substitute for empirical demonstration of their efficacy with the children? This is the crucial issue and it has to be faced. It is absurd and irresponsible to spend thousands of pounds on construction and production and nothing on evaluation. If the scheme does not pass evaluation tests it should be written off as though it were a plane that cannot fly and a pill that does not cure. The teachers are the gatekeepers and they should not let inadequate products through.

The suggestion that teachers should be competent experimenters should not be taken to mean that they ought to become research workers, developing craftier and craftier methods while children quietly turn into guinea pigs. They should, however, be competent to test both their own ideas and those of others against evidence from the children. They should intermittently try out new ideas and probe them to see if there are improvements in the children. They should never be required to continue to use some new or old scheme about which they have doubts without an opportunity for experimenting to see if their doubts are justified. Head teachers and LEA's may assert a right to require teachers to try new methods, but their subsequent authority should be vested in the success of these methods and not in their personal whims and preferences.

No doubt voices of objection will raise themselves about experimenting with children. We have already said that every teaching act is in fact experimental and cannot be otherwise until we know more about children and their learning than we do at present. The objection is an objection of frightened as opposed to responsible ignorance. Certainly if we knew much more than we do, it could easily become irresponsible to experiment. It is irresponsible of doctors to try new remedies when old ones are perfect, but when ignorance abounds, one has no alternative.

It was the checking out of these views with teachers that was our challenge. We could not operate at anything but grass roots level, but that we could manage. We must admit that what we had in mind was grander in conception than enactment, but at least it got somewhere.

The basic idea was to recruit between ten and fifteen teachers handling children of the same age from similar catchment areas. This group would meet weekly for a term and pursue two kinds of activity. There would be direct instruction and discussion about child development and there would be group conducted research. The main focus of the instructional sessions would be the work of Piaget, set within the context of other theories of child development and integrated into realms of sociology through the ideas of Bernstein in particular. More generally, we were to ask how factors in the environment might act to slow down, halt, deflect, distort, reverse or preclude the child's acquisition of knowledge with special reference to the environments of working class children.

The research was to achieve two aims. It was intended to influence the teachers both by encouraging them to think experimentally and check out their beliefs against reality and by providing them with the skills necessary for this. It was also intended to answer substantive questions about the questioning and answering behaviour of children.

A meta-objective was to evaluate the course itself and the quality of the research it produced. With this structure and content and the particular tactics adopted within these, we endeavoured to solve most of the problems mentioned. At least for the teachers participating we are able to bring to their own attention new knowledge and ideas about children's intellectual development. We did conduct experiments and show how they could provide ways of disproving the obvious and how they could resolve disputes between contradictory versions of commonsense.

Over and above this, a mixed group of teachers and research workers were able to collaborate with a maximally efficient deployment of their respective skills and resources.

The researchers could bring their general knowledge of child development to bear. They had ideas for investigations. They knew how to produce experimental designs that would allow certain questions to be answered. They had the time to construct materials and the skills to analyse and interpret data. They had the opportunity and experience to write up what was done.

The teachers were able to criticise the ideas and interpretations of the research workers, but their great contribution lay in their knowledge of what eight and nine year old children were like in terms of both capability and interest. They were able to save the rsearch from having materials either too simple or too difficult. They could say what was likely to be boring. They were prepared to test out materials on particular children to check on their suitability. Finally, they were able to administer the investigations in the course of their everyday teaching activities. No stranger 'from the university' hurried children into the medical room 'to play a game.' No questions arose about the behaviour of the children being affected by the presence of the observer.

To what advantage these features led may be seen in the experimental results of the Instep group (In-Service Training in Experiments and Psychology.)

Convening INSTEP

After a brief discussion of the proposals with the Primary Adviser of Southampton LEA, his reactive enthusiasm for the idea was translated into action with alacrity. Equipped with the handout, reproduced below, he visited appropriate schools and persuaded fourteen teachers of eight to nine year old children* in Middle Schools with predominantly council estate catchment areas to take part in the venture.

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* The children were all at least eight, while none will have been nine in the September of the school year, our experiments were conducted in the late autumn and through the winter. The average age of participating children was just over eight and three quarters.

The Handout

Piaget and the Middle School Child.

Objectives.

1. To acquaint teachers with the current state of knowledge about child development, in particular with the contribution of Piaget to our understanding of eight to nine year old children.
2. To carry out a series of individual empirical studies relevant to the teaching of eight to nine year old children. The results of these studies will be combined with other information to form a programme suitable for enhancing the effective curiosity of children.

Procedure.

1. With the co-operation of the Local Education Authority I will offer a course of 10/12 lectures/discussions (or more if desired) on Piaget. We will examine what he says and the relevant empirical evidence. We will discuss the strengths and weaknesses of his system and its implications for the educational process.

   A number of well-organized short books on this subject have appeared in recent months and one or more of these may serve as a focus for the course.

   We choose Piaget for a number of reasons. He has done and has inspired a considerable amount of work on child development, but much of it is presented in a large number of books which are generally unsystematic and difficult to understand. His private terminology is daunting. However, his work is having a substantial influence on educational policy and practice, with this likely to increase rather than wane. A clear simple introduction to his work might therefore be of use to teachers.

2. One of Piaget's points is that understanding comes through experience and experiment. For at least two reasons I would propose that each participant carry out at least one small investigation, involving comparisons of the efficacy of different materials and techniques for teaching. This would involve evaluating the relative usefulness of various materials or tactics, a procedure all too infrequent in research projects as well as teaching.

For my own part I would like to combine the results of these investigations with other data already collected in order to design a programme that might enhance the effective curiosity of children. This programme would be run and evaluated in the Spring Term. We shall of course be pleased to report back the results to all people involved in the course. I am very interested to see whether this type of combined operation is mutually beneficial. Research projects often have scant contact with the very people whom they hope will eventually apply the results they obtain, and I have thought that this type of course might well overcome this unfortunate separation.

Structure and Content of the Programme.

At the first meeting we specified the objectives and structure of the course, and an attempt was made to show how both the theoretical and empirical aspects of psychology were relevant to a study of child development in general and the teaching of children in particular. One tactic adopted for this purpose was to present the teachers with twenty six statements made by eminent philosophers and educationists. These statements represented a variety of views about the nature of children and the efficiency of various educational tactics.

There were two points to this exercise. The first was to remind participants that the international experts

Q7/1

The following statements are taken from the writings of various Old Masters: Confucius, Aristotle, Plato, Plutarch, Locke, Wesley, Rousseau, Froebel, Montessori, Pestalozzi, Robert Owen, Isaac Watts, Russell and Tolstoy. We would like to know which of the statements you agree with or disagree with. Could you circle your choice? Please treat each statement in its own right and don't try to fathom the author. The envelope contains the list of who said what, but we would prefer that this was not opened until after the items have been completed. Knowing who has said something can affect one's evaluation of the remark.

Please circle

1. Children who are forced to learn acquire a loathing for knowledge. Agree ? Disagree
2. To a great extent the character is made or marred before children enter the school room. Agree ? Disagree
3. The pupil should never be told things, he should find them out for himself. Agree ? Disagree
4. The mind of the pupil has to be prepared for the inculcation of good habits, if it is to like and dislike the things it ought. Agree ? Disagree
5. In this century when the doctrine of a just and reasonable liberty is better known, too many of the present youth break all the bonds of nature and duty and run to the wildest degree of looseness. Agree ? Disagree
6. A child must very early in life be taught a lesson which frequently comes too late...that exertion is indispensable for the attainment of knowledge. Agree ? Disagree

Please circle

7. Our educational aim must be to aid the spontaneous development of the mental, spiritual and physical personality. Agree ? Disagree

8. At school ... you see a weary shrinking creature repeating merely with his lips someone else's thoughts in someone else's words with an air of fatigue, fear and listlessness. Agree ? Disagree

9. Desire for knowledge is natural for the young. Agree ? Disagree

10. Each child unconsciously knows and wills what is best for him. Agree ? Disagree

11. Make your education laws strict and your criminal ones may be gentle - but leave youth its liberty and you will have to dig dungeons for age. Agree ? Disagree

12. The curiosity of knowing things has been given to man for a scourge. Agree ? Disagree

13. To endure is the first and most necessary lesson a child has to learn. Agree ? Disagree

14. The best overall estimate from intelligence test scores suggest that the inheritable components amount to about 80% Agree ? Disagree

15. Punishment will never be required and should be avoided as much as giving poison in their food. Agree ? Disagree

16. ... so the children of the poor should not be generally educated in such a manner as may raise Agree ? Disagree them above the services of the lower station.

Please circle

17. There is much less danger in satisfying, than in exciting the curiosity of children. Agree ? Disagree

18. It is the nature of many to be amenable to a sense of fear and to abstain from evil not because of its baseness but because of the penalties it entails. Agree ? Disagree

19. Enforced learning will not stay in the mind. So avoid compulsion and let your children's lessons take the form of play. Agree ? Disagree

20. We adults destroy most of the intellectual and creative capacity of children by the things we do to them or make them do. Agree ? Disagree

21. If for no other reason, we could well afford to throw out most of what we teach in school because the children throw out almost all of it anyway. Agree ? Disagree

22. The memory of children should be trained and exercised, for this is a storehouse of learning. Agree ? Disagree

23. The method of teaching children by a repeated practice ... til they have got the habit of doing it well ... has so many advantages. Agree ? Disagree

24. Where love ... is present in the domestic circle ... no form of education can fail to succeed Agree ? Disagree

Please circle

25. The wise parent should begin to break their will the first moment it appears. Whatever pain it cost, conquer their stubbornness. Agree ? Disagree

26. We destroy the capacities of children above all by making them afraid, afraid of not doing what other people want, of not pleasing, of making mistakes, of failing, of being wrong. Agree ? Disagree

disagreed. We could also show the diversity within the group. On average, less than two thirds of the group were in accord on the items; Concordance was greater than sixty seven per cent on only ten items: 2, 7, 8, 9, 12, 15 16, 18, 25, 26. Not only was there diversity of belief, there was also a fair incidence of 'Not knowing'.

The second point was to argue that when this diversity concerned a matter of fact, empirical investigations could be designed whose results could change opinions or dispel ignorance.

It did seem to be highly desirable to discuss and agree what were and what were not legitimate and acceptable ways of handling disputes about matters of fact. Without such consensus there could have been a running cynicism about all else that was to follow.

Following this initial scene-setting a standard, but flexible, format was established with lecture/discussion sessions of three quarters of an hour, followed by discussions of experiments and their results.

As the topics show, the course was in fact extended to last just over one and a half terms and the syllabus widened to cover language development.

Topics of Sessions.

1 & 2	Introduction to child development: psycho-analytic, Neo-behaviourist and Cognitive Developmental approaches. Comparisons in terms of foci of interest and emphasis accorded to various factors such as heredity versus environment, pre-programming versus environmental contingences, sources of motivation, importance of early learning, etc...
3 & 4	Development of moral reasoning: Piaget and extensions.
5	Cognitive developmental approach: Basic concepts, stages, and approach.
6 & 7	Sensory-Motor Stage
8	Preoperational - Intuitive Stage
9	Blocks to Development of Concrete Operations
10	Concrete Operational Stage: Introduction to operations in classifying and conserving.
11	Classification: groupings and stages in handling horizontal and vertical sets.
12	Conservation of amount etc...., including assessment of impotance.
13	Training in conservation
14	Language development: its role in development
15	Social factors and language development

There were sufficient introductory texts on Piaget for everyone to have one, and additional relevant books were incorporated into a small library. This was not used extensively. Handouts were prepared which summarized information on main points. Two films were shown.

For the experiments a different procedure was adopted. We told the teachers what our research was about outlining our results and beliefs about social class differences in questioning and answering behaviour (see chapter 1). We went on to say that what we wished to do was find out a little more about children's preferences for some types of answer rather than others, but in the main to find out how we might encourage efficient questioning and answering in eight and nine year olds from non-middle class backgrounds.

We established which schools were comparable to which in terms of catchment area and modernness of equipment and buildings, so that we could group schools together for experimental design purposes. We presented brief handouts for some six investigations and fumbled our semi-democratic way through to deciding which schools would contain which investigations. We would then prepare materials and have the group discuss them. When there was agreement about the suitability of these we went ahead, when there was not, a teacher from an uninvolved school would check out the materials and report back. Once a design, procedure and materials were agreed, the investigation would be run, and we would analyse the results and report back to the group.

There was a measure of disorderliness about this. The psychologists were diffident about pushing and imposing, but when we all got to know each other better, it was easier to achieve agreed decisions.

Evaluation of the Course.

Originally, we had prepared a massive set of questions about child development to be given at the beginning and end of the course. The replies would have shown the teachers how much they had learned and us what the weaknesses and strengths of the course had been. The Primary Adviser was asked to play his eponymous role and cautioned against frightening the teachers with our questionnaires. Their subsequent comments justified his caution. It should be possible, however, to test knowledge acquired on a weekly basis once rapport and trust are established.

We did seek some guidance for future courses by sending out a questionnaire a fortnight after the farewell party. Of the fourteen teachers who had been present at the start of the course, two had been forced to abandon it by prolonged illness and one had found the logistics of the journey from school too complex. Ten of the other eleven returned the forms completed. The questionnaire contained two questions that could certainly have been more sensibly worded, viz. Q.9 which is incomprehensible and Q.13 which might usefully have been elaborated.

The Questionnaire.

Structure.

1a. Should the course have been longer, shorter or about one and a half terms?

....

1b. What is the best size for the group?

....

2. Should there have been more or less Piaget?

....

3. Should there have been more or fewer experiments?

....

4. Do you think the balance of co-operation in the experiments was roughly right?
   (a) Would you have liked to design your own? ....
   (b) If Yes to (a) how should have facilitated this? ....
   (c) Do you think we should have consulted you more or less about materials and design?

   ....

   (d) We will send you more detailed information about the data collected during the summer term, but should we have given you more results as we went along?

   ....

5. How could I have improved my efforts to communicate Piaget's ideas?

....

6. Was the somewhat random division of time sensible or would we have done better to:

(a) been more careful to divide time equally.................

(b) had alternate weeks on Piaget and experiments..................

(c) other...............................

Content

7. Was the balance between the stagec and aspects of development as seen by Piaget all right?

Please tick

More About Right Less

- (i) Introduction of basic ideas: schema, assimilation, accommodation, representation of knowledge.
- (ii) Sensory motor stage
- (iii) Development from 2 - 7 or so: roles of play-imitation, animism, artificialism, realism.
- (iv) Concrete operations: classificatory capacities (groupings!)
- (v) Concrete operations: conservation
- (vi) Language development
- (vii) Moral development (remember?)
- (viii) General introduction to child development.
- (ix) Social factors, reinforcement and development.

8. What about the use of films? If more how many more......

If less how many less......

If you think there should have been more what would you suggest they should focus upon:

1.

2.

3.

4.

9. Should we have asked you to do some tests of individual children to see how, for example, children's classificatory and conservation behaviour relates to Piaget's ideas? Please tick - Yes No If 'Yes', how many tests of say 6 children per test could you have felt you could have run without too much effort?......

10. Should we have suggested that you read sections of books before coming each week? Yes No

11. Were the level of presentation and degree of repetition all right?

....

12. If we find when we analyse data that we would like to repeat or vary some investigations, would you be able and keen to run anything further?

....

13. I wanted to give out tests of knowledge about the capacities of children at the beginning and end. Would you have been put off by this?

....

14. Any other topics worth including in such a course?.......

15. Any other comments (all welcome)

The comments suggested the preceived worthwhileness, both of basically instructional courses and getting experimental research conducted in this manner. In answer to Q.12 everyone expressed a willingness or volunteered with enthusiasm for collecting more data.

Half the group felt that the level of presentation was too general and abstract, and in their answers to other questions, they pointed to ways of improvement. Repetition was mentioned as desirable by several. Since it was in fact customary to summarise at the end of each session, quickly run over the previous week's content, and most points were probably repeated at least once, this criticism emphasises the need for considerable revision and recapitulation. Demonstrations of concrete examples with materials were mentioned as a useful aid. Normally we made do with whatever was to hand, and this was inadequate. It would be sensible to invest in some simple special materials. We showed only two films during the course, and most participants thought that two or three more would have been useful. (They are available.) It is also true that the films could be both a useful relief, change and means of illustrating with real concrete examples. Since everyone thought it would have been sensible to have tested more individual children on classificatory and conservation tasks and generally said they thought they could have tested four or five children a week, this would be worth building into any such operation.

What emerges is hardly surprising. The criticisms point to insufficient use of prepared materials, insufficient practice opportunities to see if children in their classes really were like the theory said they should be, and some inadequacy of inexperience - on the part of the psychologists.

Improvements and Developments.

Improvements.

Improvements peculiar to our course are of only personal and parochial interest, but there are at least four aspects of our activities that may have wider significance.

The time of day at which such courses would be most efficacious is an issue about which a majority of people within the educational system might well agree. In principle at least : it would be better if the acquisition of new knowledge could occur earlier in the day and in the firm's time. The latter view can be supported in so far as we view the role of the teacher as one requiring the periodic exposure to new ideas and techniques and one requiring teachers themselves to be actively involved in the evaluation and dissemination of new knowledge. Earliness in the day would be defended by appealing to the evidence that it is particularly difficult to attend to, understand and learn new knowledge when one is fatigued. But principles do not necessarily help with decisions about priorities. And who is to watch the mice when the cat is away? Organisation does not present a difficult administrative problem in and of itself, but current staffing arrangements ensure administrative difficulties and discontent. An appropriate solution will be found only after enough people with enough power create an atmosphere that will insist upon a change in the present conceptions of the teacher's role.

A second less general criticism of the course, that may be a simple indictment of the organisers' naivety, would suggest a change in the balance of the content, less of the general abstract and more of the particular concrete. We were aware of the danger of wittering in technical jargon and made a strenuous effort to bridge the gap between idealised theoretical models of children's competence and this six year old who thinks there are more tulips than flowers in this vase. A personal guess is that academics are likely, even after making adjustments, to fail to maintain a persistent anchoring to specific instances of teaching problems. In practice this means a running check on the perceived relevance and value of what is being communicated.

We should also have evaluated the changes achieved. In what ways did participants benefit? Was only their morale enhanced? Did they learn how to conduct experiments within the domain we were examining? Did they change their theories of child development? Did they now see why some skills might have to precede others in growing children? There does seem to be a climate of opinion which sees testing as evaluation of the tested rather than as an evaluation of the material, the instructor or the interaction of the variables.

Not only does evaluation have this peculiar bias of focus, it also carries overtones of the blameworthiness or praiseworthiness of the individuals learning. A change in orientation, whereby evaluation took on the meaning of knowledge of results, would be more helpful; if it were seen as information about progress made and next steps to be taken, it would be easier to introduce what is an imperative in any excursion into learning and teaching. Alas, we did not evaluate the teachers' learning in any systematic way.

Finally, we failed to follow through. Our course was yet another one-off job with loose ends left untied, so it died. We had intended to write up the venture quickly and repeat an improved version in the following year and then use that as the cornerstone of an organic structure, but this hope foundered. Staff leaving and other commitments and priorities accumulated to render the scheme unviable, but others may repeat, improve and develop such activities.

Development.

Teachers' Centres are the obvious base of operations. Six months of weekly sessions may have a natural viability. A group of between ten and fifteen working teachers with a common interest, one or more researcher, and preferably an LEA representative may be about the right size.

The common interest could be in the age of children taught, the subject of main concern, or in a particular scheme or technique. The researcher should have the responsibility for finding out all there is to know about the topic, organising this into features for instruction, discussion and experimentation. What evidence is there that the Bloggs Reading Scheme works? What is meant by the claim of its producers that they have 'scientifically tested' it? Put it to the test and evaluate it. One suspects that too many courses fail to pose the critical questions and then pursue the answers to these by systematic investigation. How can children be encouraged to find out if they see only motes of routine acceptance in the eyes of teachers and researchers?

At the end of the courses what is to be done with the knowledge accumulated? There is nothing odd about writing books. It is even less strange to write journal articles, but what might be particuarly useful would be to organise publication regionally. Day-conferences at which the teacher participants report their activities to other teachers in their LEA and neighbouring areas are one possibility. These could not only spread the information, but might motivate others to join groups. It should boost morale to be actually doing something with results found by oneself. Following such an occasion, papers could be written, gestetnered and circulated to other interested parties. The newly constituted LEA's should be large enough to maintain bi-annual regional journals of education.

There are many advantages to such activities, and they require nothing but the will to start moving.

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